

UNIVERSITY OF CALIFORNIA. Pennentramia steel co LIBRARY GIFT OF OF THE Class

December 17, 1907.

President, "ennsylvania Steel Co.

Steelton, Tepraylvania.

Dear Cir:-

will you whally favor this library, for the use of our engineer-

ing students, with a copy of the new hlet published in 1906 by your compary entitled "Spirels for Street Lailway Curves, Formulas and Tables."?

Librarian.

for

Yours very truly.







## SPIRALS

#### for

Street Railway Curves and Easement Curves

## for

## Street Railway Branch-Offs

UNIVERSITY OF THE OF CALIFORNIA

## Complete Formulas and Tables

## The Pennsylvania Steel Company

Steelton, Pa.

FROG AND SWITCH DEPARTMENT

Copyright 1906 by The Pennsylvania Steel Company, Steelton, Pa.

4

THE PENNSYLVANIA STEEL COMPANY

UNIV

F86

## LIST OF OFFICES

of

ALIFORN

## The Pennsylvania Steel Company

#### GENERAL SALES OFFICE

Philadelphia, Pa., Girard Trust Building

Cable Address, Pennsteel, Philadelphia. (Use Lieber's Code.) BALTIMORE, MD. . . Continental Trust Building BOSTON, MASS. 70 Kilby Street CHICAGO, ILL. Western Union Building 110 Cannon Street, E. C. LONDON, ENG. . 76 Calle de Cinco de Mayo MEXICO. MEX. NEW YORK CITY, N. Y. 71 Broadway . . . . PHILADELPHIA, PA. . . . Girard Trust Building SAN FRANCISCO, CAL. . 829 Goldon Gato Avenue ST. LOUIS, Mo. . Commonwealth Trust Building STEELTON, PA. Works

5



path followed by the center of gravity of the cars. The purpose of a spiral ending on a short radius street railway curve is not as in steam railroad practice, to enable the super-elevation of the outer rail of curve to be gradually attained, but to reduce the shock due to the change in direction of the car. The switch easements are so designed that a plain curve can be converted

into a branch-off with the minimum disturbance of existing work while retaining standard switches and mates, and some simplification of computation is also obtained. The solutions of the various problems given present sufficient information to enable any data required for the laying out or construction of track to be readily secured.

tool of which all works

PROBLEM 1. To select a spiral.

(a) The radius of the main curve must be less than the preceding branch of the spiral, must be more than the next branch would be were it produced, and should nearly equal the latter.

( $\delta$ ) The longer the spiral, the easier the entrance will be. But bear in mind that the main body of the curve should be circular, the spiral simply acting as an entrance to it.

(c) A spiral of less than three branches should not be used.



PROBLEM 2. Given: A circular curve with symmetrical spirals, to find the tangent and external distances.

O G=R+X—versine S° R; G S=Y—sine S° R;

8



Problem 3

PROBLEM 3. Given: The tangent distance V S, the intersection angle  $\triangle$ , and the desired length of spiral, to find the radius of the curve. Approximate R=cotangent  $\frac{1}{2} \triangle (V S - \frac{1}{2} \text{ length of spiral})$ . Having selected a spiral by this radius, the exact radius may be found, if required, by the following formula:

$$R = \frac{\cos \frac{1}{2} \Delta (V S - Y - X \tan \frac{1}{2} \Delta)}{\sin e (\frac{1}{2} \Delta - S)}.$$

Caution—If the result is enough different from the original radius to require a change in the spiral by Problem 1, a second trial must be made.

**PROBLEM 4.** Given: The intersection angle  $\triangle$ 

and the external distance V H, to find the radius. Approximate to the radius by finding that for a simple curve passing through the point H, and select a spiral for a radius somewhat smaller.

Then 
$$R = \frac{V H \cos \frac{1}{2} \Delta - X}{\cos S^{\circ} - \cos \frac{1}{2} \Delta}$$
 (Searle).

Caution—If the result is enough different from the original radius to require a change in the spiral by Problem 1, a second trial must be made.



Problems 5 and 6

PROBLEM 5. Given: The X and Y for any point on the spiral; to find the deflection from the tangent at the point of spiral.

Tangent deflection  $angle = \frac{X}{\nabla}$ .

PROBLEM 6. Given: The X and Y for any point on the spiral, to find the long chord.

(a) Long chord =  $\frac{\chi}{\text{cosine def angle}}$ ,

or (b) Long chord =  $\sqrt{X^2 + Y^2}$ .

PROBLEM 7. Given: X and Y for a point on the spiral, to find X' and Y' on a line parallel to the spiral, and offset the distance S S' inside the spiral.

X'=X-S S' versine S°;

Y'=Y-S S' sine S°.

Note—Problems 5 and 6 can then be applied to X' and Y' if it is desired to use deflection angles to lay out the curve.

10



#### Problem 7

As these curves will almost invariably be laid out on an offset varying with the gage of the road, the deflections are not figured in the table.

T

#### Problem 8

PROBLEM 8. Given: A circular curve with spirals to find the distance V V', in order to lay out a

tangent to the circular curve, from which the latter may be laid out in the usual manner.



Problem 9

PROBLEM 9. General solution for unsymmetrical curves.

O G=R+X-R versine S°; G S=Y-R sine S°; O G'=R+X'-R versine S°'; G S'=Y-R sine S°; V S=tan  $\frac{1}{2} \triangle O$  G+G S+ $\frac{O G'-O G}{sine \triangle}$ ; V S'=tan  $\frac{1}{2} \triangle O$  G+G' S' $\pm \frac{O G'-O G}{tan \triangle}$ .

Note  $-\pm$  in above; + if  $\triangle$  is more than 90°, and - if  $\triangle$  is less than 90°.



Problem 10

PROBLEM 10. Given: The middle ordinate for a chord of length a b for R and R', to find the middle ordinate at the P C C. From the figure it is evident that d' c' bisects c d.

$$\cdots$$
 e f= $\frac{c f+d f}{2}$ .

Therefore, the middle ordinate at any P C C in the spiral equals one-half the sum of the middle ordinates for the radii on each side for the same chord.



Problem 11

PROBLEM 11. Given: That portion of a spiral with equal chords L, L' and L" and angles a-b, a, and a+b, to find the middle ordinate at the center of the chord L in the length D' C'.

C F = C' A and D F = D' B.

From the figure it is evident that D' C' bisects C D.

$$\therefore E F = \frac{C F + D F}{2}$$

Then C' A= $\frac{1}{2}$  L tan  $\frac{1}{4}a + L'$  sine  $(\frac{1}{2}a + \frac{a+o}{2});$ 

D' 
$$B = \frac{1}{2} L \tan \frac{1}{4} a + L' \sin \left(\frac{1}{2} a + \frac{1}{2}\right);$$

and since the sines of small angles are proportional to the angles,

$$\frac{C F+D F}{2} = E F = \frac{1}{2} L \tan \frac{1}{4} a + L \operatorname{sine} a.$$

But this last equation equals the middle ordinate in the length A B for the radius of the central arc; and since the increment to the angle b would be equal if L' and L" were equal, the middle ordinate at the center of any arc of the spiral, for any length of chord, is equal to the middle ordinate of the radius of that arc in the same length.



# Standard Spirals. The Pennsylvania Steel Co.

# Center Line Data.



### SPIRAL No. 2

Rad.	Angle	x	Y	S°	Versine	Sine
$   \begin{array}{r}     300 \\     150 \\     100 \\     75 \\     60 \\     50 \\     42 \frac{1}{2} \\     37 \frac{1}{2}   \end{array} $	0°-30' 1°-00' 1°-30' 2°-00' 2°-30' 3°-00' 3°-00' 3°-30' 4°-00'	$\begin{array}{c} 0.011\\ 0.057\\ 0.160\\ 0.342\\ 0.627\\ 1.036\\ 1.587\\ 2.309 \end{array}$	$\begin{array}{r} 2.618\\ 5.235\\ 7.851\\ 10.463\\ 13.065\\ 15.651\\ 18.187\\ 20.703\\ \end{array}$	0°-30' 1°-30' 3°-00' 5°-00' 7°-30' 10°-30' 14°-00' 18°-00'	.00004 .00034 .00137 .00381 .00856 .01675 .02970 .04894	.00873 .02618 .05234 .08716 .13053 .18224 .24192 .30902

## SWITCH EASEMENT S 2-75

Rad.	Angle	x	Y	S°	This Ease-
75 45 <sup>1</sup> / <sub>3</sub> 42 <sup>1</sup> / <sub>2</sub> 37 <sup>1</sup> / <sub>2</sub>	7°-50' 2°-40' 3°-30' 4°-00'	$\begin{array}{r} 0.700 \\ 1.036 \\ 1.587 \\ 2.309 \end{array}$	$10.222 \\12.305 \\14.841 \\17.357$	7°–50' 10°–30' 14°–00' 18°–00'	ment gives an O G equal to and a G S 3.346 less than Spiral No. 2.

## SPIRAL No. 21/2

Rad.	Angle	х	Y	S°	Versine	Sine
444 222 148 111 89 74 63 ½ 55 ½ 49 44 ½	0°-20' 0°-40' 1°-00' 1°-20' 1°-40' 2°-00' 2°-20' 2°-20' 2°-40' 3°-00' 3°-20'	$\begin{array}{c} 0.007\\ 0.038\\ 0.105\\ 0.226\\ 0.414\\ 0.684\\ 1.051\\ 1.529\\ 2.128\\ 2.870 \end{array}$	$\begin{array}{r} 2.583\\ 5.166\\ 7.748\\ 10.328\\ 12.910\\ 15.478\\ 18.038\\ 20.576\\ 23.070\\ 25.550\\ \end{array}$	0°-20' 1°-00' 2°-00' 3°-20' 5°-00' 7°-00' 9°-20' 12°-00' 15°-00' 18°-20'	.00002 00015 .00061 .00169 00381 .00745 .01324 .02185 .03407 .05076	.00582 .01745 .03490 .05814 .08716 .12187 .16218 .20791 .25882 .31454
40 1/2	3°-40'	3.763	27.983	22°-00'	.07282	.37461

\*\*

SWITCH EASEMENT S 2½-100

Rađ.	Angle	x	Y	S°	This Ease-
$   \begin{array}{r}     102 \frac{1}{3} \\     56 \frac{1}{2} \\     49 \\     44 \frac{1}{2} \\     40 \frac{1}{2}   \end{array} $	6°-30'	0.658	11.584	6°-30'	ment gives an
	5°-30'	1.529	16.936	12°-00'	O G equal to
	3°-00'	2.128	19.430	15°-00'	and a G S
	3°-20'	2.870	21.910	18°-20'	3.640 less than
	3°-40'	3.763	24.343	22°-00'	Spiral No. $2\frac{1}{2}$ .

SWITCH EASEMENT S 2½-200

Rad.	Angle	x	Y	S°	
Rad. 200 129 74 63 <sup>1</sup> / <sub>2</sub> 55 <sup>1</sup> / <sub>2</sub> 49 44 <sup>1</sup> / <sub>2</sub> 40 <sup>1</sup> / <sub>2</sub>	Angle 4°-00' 1°-00' 2°-00' 2°-20' 2°-40' 3°-00' 3°-20' 3°-20' 3°-40'	x 0.487 0.664 0.934 1.301 1.779 2.378 3.120 4.013	¥ 13.951 16.196 18.764 21.324 23.862 26.356 28.836 31.269	5°-00' 5°-00' 7°-00' 9°-20' 12°-00' 15°-00' 18°-20' 22°-00'	This Ease- ment gives an O G $0.250$ greater and a G S $3.286$ greater than Spiral No. $2\frac{1}{2}$ .
401/2	3°-40'	4.013	31.269	22°-00'	opiai ito. 23.

SPIRAL No. 3

Rad.	Angle	x	Y	S°	Versine	Sine
$     \begin{array}{r}       300 \\       150 \\       100 \\       75 \\       60 \\       50 \\       40     \end{array} $	1°-00' 2°-00' 3°-00' 4°-00' 5°-00' 6°-00' 7°-00'	$\begin{array}{c} 0.046\\ 0.229\\ 0.639\\ 1.368\\ 2.501\\ 4.118\\ 6.143\\ \end{array}$	$\begin{array}{r} 5.236\\ 10.468\\ 15.688\\ 20.871\\ 25.982\\ 30.959\\ 35.403\end{array}$	1°-00' 3°-00' 6°-00' 10°-00' 15°-00' 21°-00' 28°-00'	.00015 .00137 .00548 .01519 .03407 .06642 .11705	$\begin{array}{r} .01745\\ .05234\\ .10453\\ .17365\\ .25882\\ .35837\\ .46947\end{array}$

### SWITCH EASEMENT S 3-100

Rad.	Angle	Х	Y	S°
1021/3	6°-30'	0.658	11.584	6°-30'
81 60	3°-30' 5°-00'	$1.368 \\ 2.501$	$16.480 \\ 21.591$	$10^{\circ}-00'$ $15^{\circ}-00'$
50	6°-00'	4.118	26.568	21°-00'
40	7 -00	0.143	51.012	28 -00

This Easement gives an O G equal to and a G S 4.391 less than Spiral No. 3.

### SWITCH EASEMENT S 3-200

Rad.	Angle	x	Y	S°	This Ease-
$200 \\ 132 \\ 75 \\ 60 \\ 50 \\ 40$	4°-00' 2°-00' 4°-00' 5°-00' 6°-00' 7°-00'	$\begin{array}{r} 0.487\\ 0.889\\ 1.618\\ 2.751\\ 4.368\\ 6.393\end{array}$	$\begin{array}{r} 13.951 \\ 18.541 \\ 23.724 \\ 28.835 \\ 33.812 \\ 38.256 \end{array}$	4°-00' 6°-00' 10°-00' 15°-00' 21°-00' 28°-00'	ment gives an O G 0.250 greater and a G S 2.853 greater than Spiral No. 3.

#### SPIRAL No. 4

Rad.	Angle	x	Y	S°	Versine	Sine
420	0°-42'	0.031	5.131	0°-42′	.00007	.01222
210	1°-24'	0.157	10.261	2°-06'	.00067	.03664
140	2°-06'	0.439	15.384	4°-12'	.00269	.07324
105	2°-48'	0.939	20.490	7°-00'	.00745	.12187
84	3°-30'	1.720	25.561	10°-30'	.01675	.18224
70	4°-12'	2.839	30.567	14°-42'	.03273	.25376
60	4°-54'	4.352	35.469	19°-36'	.05794	.33545

### SWITCH EASEMENT S 4-200

Rad.	Angle	x	Y	S°	This Ease-
$200 \\ 125 \frac{1}{2} \\ 84 \\ 70 \\ 60$	4°-00' 3°-00' 3°-30' 4°-12' 4°-54'	$\begin{array}{r} 0.487 \\ 1.117 \\ 1.898 \\ 3.017 \\ 4.530 \end{array}$	$\begin{array}{r} 13.951 \\ 20.490 \\ 25.561 \\ 30.567 \\ 35.469 \end{array}$	4°-00' 7°-00' 10°-30' 14°-42' 19°-36'	ment gives an O G 0.178 greater and a G S equal to Spiral No. 4.

#### SPIRAL No. 5

Rad.	Angle	x	Y	S°	Versine	Sine
$\begin{array}{r} 600\\ 300\\ 200\\ 150\\ 120\\ 100\\ 85 \end{array}$	0°-30' 1°-00' 1°-30' 2°-00' 2°-30' 3°-00' 3°-30'	$\begin{array}{r} 0.023\\ 0.114\\ 0.320\\ 0.685\\ 1.255\\ 2.073\\ 3.175 \end{array}$	$\begin{array}{r} 5.236\\ 10.471\\ 15.703\\ 20.926\\ 26.130\\ 31.302\\ 36.374 \end{array}$	0°-30' 1°-30' 3°-00' 5°-00' 7°-30' 10°-30' 14°-00'	$\begin{array}{r} .00004\\ .00034\\ .00137\\ .00381\\ .00856\\ .01675\\ .02970\\ \end{array}$	.00873 .02618 .05234 .08716 .13053 .18224 .24192

SWITCH EASEMENT S 5-200

Rad.	Angle	x	Y	S°	This Ease-
$200 \\ 144 \\ 120 \\ 100 \\ 85$	4°-00' 1°-00' 2°-30' 3°-00' 3°-30'	$\begin{array}{r} 0.487 \\ 0.685 \\ 1.255 \\ 2.073 \\ 3.175 \end{array}$	$\begin{array}{r} 13.951 \\ 16.458 \\ 21.662 \\ 26.834 \\ 31.906 \end{array}$	4°-00' 5°-00' 7°-30' 10°-30' 14°-00'	ment gives an O G equal to and a G S 4.468 less than Spiral No. 5.

### SPIRAL No. 6

Rad.	Angle	x	Y	S°	Versine	Sine
$900 \\ 450 \\ 300 \\ 225 \\ 180 \\ 150 \\ 128$	0°-20' 0°-40' 1°-00' 1°-20' 1°-40' 2°-00' 2°-20'	$\begin{array}{r} 0.015\\ 0.076\\ 0.213\\ 0.457\\ 0.837\\ 1.385\\ 2.125\end{array}$	$\begin{array}{r} 5.236\\ 10.472\\ 15.706\\ 20.936\\ 26.158\\ 31.365\\ 36.524 \end{array}$	0°-20' 1°-00' 2°-00' 3°-20' 5°-00' 7°-00' 9°-20'	.00002 .00015 .00061 .00169 .00381 .00745 .01324	.00582 .01745 .03490 .05814 .08716 .12187 .16218

## SWITCH EASEMENT S 6-200

Rad.	Angle	x	Y	S°	This Ease- ment gives an
200 255 150 128	4°-00' 1°-00' 2°-00' 2°-20'	$\begin{array}{r} 0.487 \\ 0.837 \\ 1.385 \\ 2.125 \end{array}$	$\begin{array}{r} 13.951 \\ 18.388 \\ 23.595 \\ 28.754 \end{array}$	4°-00' 5°-00' 7°-00' 9°-20'	O G equal to and a G S 7.770 less than Spiral No. 6.

## SPIRAL No. 7

Rađ.	Angle	x	Y	S°	Versine	Sine
$1260 \\ 630 \\ 420 \\ 315 \\ 252 \\ 210 \\ 180 \\ 157$	$\begin{array}{c} 0^{\circ}-15'\\ 0^{\circ}-30'\\ 0^{\circ}-45'\\ 1^{\circ}-00'\\ 1^{\circ}-15'\\ 1^{\circ}-30'\\ 1^{\circ}-30'\\ 1^{\circ}-45'\end{array}$	$\begin{array}{c} 0.012\\ 0.060\\ 0.168\\ 0.360\\ 0.660\\ 1.091\\ 1.678\\ \end{array}$	$\begin{array}{c} 5.498\\ 10.995\\ 16.492\\ 21.987\\ 27.475\\ 32.957\\ 38.424 \end{array}$	0°-15' 0°-45' 1°-30' 2°-30' 3°-45' 5°-15' 7°-00'	.00001 .0009 .00034 .00095 .00214 .00420 .00745	$\begin{array}{r} .00436\\ .01309\\ .02618\\ .04362\\ .06540\\ .09150\\ .12187\end{array}$

## SPIRAL No. 8

Rad.	Angle	x	Y	S°	Versine	Sine.
$1890 \\945 \\630 \\472 \frac{1}{2} \\378 \\315 \\270 \\236$	0°-10' 0°-20' 0°-30' 0°-40' 0°-50' 1°-00' 1°-10'	$\begin{array}{c} 0.008\\ 0.040\\ 0.112\\ 0.241\\ 0.441\\ 0.729\\ 1.120\\ \end{array}$	$\begin{array}{r} 5.498\\ 10.996\\ 16.493\\ 21.990\\ 27.483\\ 32.973\\ 38.457\end{array}$	$\begin{array}{c} 0^{\circ}-10'\\ 0^{\circ}-30'\\ 1^{\circ}-00'\\ 1^{\circ}-40'\\ 2^{\circ}-30'\\ 3^{\circ}-30'\\ 4^{\circ}-40' \end{array}$	.00000 .00004 .00015 .00042 .00095 .00187 .00332	$\begin{array}{c} .00291\\ .00873\\ .01745\\ .02908\\ .04362\\ .06105\\ .08136\end{array}$

SPIRAL No. 9

Rad.	Angle	x	Y	S°	Versine	Sine
$2730 \\ 1365 \\ 910 \\ 682 \frac{1}{2} \\ 546 \\ 455 \\ 390 \\ 341$	$\begin{array}{c} 0^{\circ}-7'\\ 0^{\circ}-14'\\ 0^{\circ}-21'\\ 0^{\circ}-28'\\ 0^{\circ}-35'\\ 0^{\circ}-42'\\ 0^{\circ}-49'\\ \end{array}$	$\begin{array}{c} 0.006\\ 0.028\\ 0.079\\ 0.170\\ 0.311\\ 0.515\\ 0.792\\ \end{array}$	5.559 11.118 16.677 22.234 27.791 33.346 38.899	0°-7' 0°-21' 0°-42' 1°-10' 1°-45' 2°-27' 3°-16'	.00000 .00002 .00007 .00021 .00047 .00091 .00162	$\begin{array}{c} .00204\\ .00611\\ .01222\\ .02036\\ .03054\\ .04275\\ .05698\end{array}$

## SPIRAL No. 10

Rad.	Angle	x	Y	S°	Versine	Sine
$\begin{array}{r} 3780\\ 1890\\ 1260\\ 945\\ 756\\ 630\\ 540\\ 472 \end{array}$	$\begin{array}{c} 0^{\circ}-05'\\ 0^{\circ}-10'\\ 0^{\circ}-15'\\ 0^{\circ}-20'\\ 0^{\circ}-25'\\ 0^{\circ}-30'\\ 0^{\circ}-35'\end{array}$	$\begin{array}{c} 0.004\\ 0.020\\ 0.056\\ 0.120\\ 0.220\\ 0.364\\ 0.560 \end{array}$	5.498 10.996 16.493 21.991 27.488 32.983 38.478	$\begin{array}{c} 0^{\circ}-05'\\ 0^{\circ}-15'\\ 0^{\circ}-30'\\ 0^{\circ}-50'\\ 1^{\circ}-15'\\ 1^{\circ}-45'\\ 2^{\circ}-20'\end{array}$	.00000 .00001 .00004 .00011 .00024 .00047 .00083	.00145 .00436 .00873 .01454 .02181 .03054 .04071

#### SPIRAL No. 11

Rad.	Angle	x	Y	S°	Versine	Sine
$\begin{array}{c} 5250\\ 2625\\ 1750\\ 1312 \frac{1}{2}\\ 1050\\ 875\\ 750\\ 656 \end{array}$	0°-04' 0°-08' 0°-12' 0°-16' 0°-20' 0°-24' 0°-24'	.0035 .0178 .0498 .1066 .1955 .3234 .4975	$\begin{array}{r} 6.109\\ 12.217\\ 18.326\\ 24.434\\ 30.542\\ 36.649\\ 42.756\end{array}$	0°-04' 0°-12' 0°-24' 0°-40' 1°-00' 1°-24' 1°-52'	.00000 .00001 .00002 .00007 .00015 .00030 .00053	.00116 .00349 .00698 .01164 .01745 .02443 .03257

### SPIRAL No. 12

Rad.	Angle	x	Y	S°.	Versine	Sine
7140 3570 2380 1785 1428 1190 1020 892	$\begin{array}{c} 0^{\circ}-03'\\ 0^{\circ}-06'\\ 0^{\circ}-09'\\ 0^{\circ}-12'\\ 0^{\circ}-15'\\ 0^{\circ}-15'\\ 0^{\circ}-18'\\ 0^{\circ}-21'\end{array}$	.0027 .0136 .0381 .0816 .1495 .2474 .3806	$\begin{array}{r} 6.231\\ 12.462\\ 18.692\\ 24.923\\ 31.153\\ 37.384\\ 43.613\end{array}$	0°-03' 0°-09' 0°-18' 0°-30' 0°-45' 1°-03' 1°-24'	.00000 .00000 .00001 .00004 .00009 .00017 .00030	.00087 .00262 .00524 .00873 .01309 .01832 .02443



23

# Tables giving elements of SPIRALS for Inner Gage Line Lengths of Rails and Tie Rod Spacing for

Various Gages.



																			,
	Correc-	T Rail	.001	.002	.005	.008	.012	.016	.022	.028			uter Rail	16.45	17.50	18.56	19.62	20.68	
	Length	Inner	2.597	5.174	7.731	10.267	12.782	15.277	17.729	20.182			Rail O	55	50	44	38	32	
2 IN.	Length	Outer	2.639	5.298	779.7	10.677	13.398	16.139	18.879	21.662	S.		Inner	15.	16.	17.	18.	19.	
FT. 85	Cino	ATTIC	.00873	.02618	.05234	.08716	.13053	.18224	.24192	.30902	MOA		Outer Rail	11.23	12.26	13.30	14.35	15.40	
GE, 4	Transing	ATTE TA A	.00004	.00034	.00137	.00381	.00856	.01675	.02970	.04894	CES F		ner Rail	10.77	11.74	12.70	13.65	14.60	
GA	00	à	0°-30'	1°-30'	3°-00'	2°-00′	7°-30'	10°-30'	14°-00'	18°-00′	STAN		Rail In	8	0	3	9	6	
No. 2.	Rail	Υ	2.597	5.173	7.728	10.258	12.758	15.222	17.618	19.976	IC C		Outer ]	. 6.0	7.1	8.1	9.1	10.1	
RAL ]	Inner	X	0.011	0.056	0.157	0.333	0.607	766.0	1.517	2.194	LE RO		Inner Rai	5.92	6.90	7.87	8.84	9.81	
IdS	And	Augue	0°-30'	1°-00′	1°-30'	2°-00'	2°-30'	3°-00'	3°-30'	4°-00'	L	-	ter Rail	1.01	2.02	3.03	4.04	5.06	
	Cent.	Rad.	300	150	100	75	60	50	42 1/2	37 1/2 33 1/2			ail Ou						
	Point	No.	1	02	3	4	20	9	2	œ			Inner R.	66.	1.98	2.97	3.96	4.94	

ő	ent.	Amoria	Inner	Rail	Co	Length	Length	Correc-	
×	tad.	argue	x	Y /	2	Outer	Inner	T Rail	This Eas
		20 4PC					A LOW LAND		ment gives a
2	2	7°-50'	.678	9.901	7°-50'	10.576	9.932	.012	O G equal
4	513	2°-40'	700.	11.876	10°-30'	12.795	11.933	.016	3.346 less the
4	21/2	3°-30′	1.517	14.272	14°-00′	15.535	14.385	.022	Spiral No. 2
60	7 1/2	4°-00'	2.194	16.630	18°-00'	18.318	16.838	.028	

	Correc-	T Rail	0.000	0.005	0.011	0.019	0.085		Outer Rail	26.76 27.82 28.88	
	Length	Inner	2.569 5.125 7.667	10.195	15.216	20.180	27.516		Inner Rail	25.24 26.18 27.12	
IN.	eneth	Duter	2.597 5.207 7.881	0.469	5.792	21.166 23.855	20.324 29.324	S.	Outer Rail	21.51 22.56 23.60 23.60 23.60 23.71	
. 81/2		0	898	6	22 8	E SS	4 II	1 P.	Inner Rail	20.49 21.44 22.39 24.29	
FT		OIIIC	0058.0058	0581	1218	2588	.3740	RON	ail		
E, 4		rsine	0002 0015 00061	0169	0745	2185	17282	EI S	ч КО	200	
AG		<	0.000					VCE:	Inne Rail	15.69 17.68 18.58 19.54	
2.0	2	20	0°-20	3°-20	00-02	12°-00	520-00	STAN	Outer Rail	11.15 12.18 13.21 14.24 15.27	
No. 25	Rail .	Υ	2.569 5.125 7.666	10.191	15.191	20.087 22.461	24.510	ID DI	Inner Rail	10.85 11.82 12.79 13.76 14.73	
LAL 1	Inner	x	.007 .088 0.104	0.222	0.666	2.048	8.592	E RC	Outer Rail	6.05 7.07 8.09 9.11 10.13	
SPIF	-	Angle	0°-20' 0°-40' 1°-00'	10-20	20-00	20-40' 30-00'	80-40'	T	Inner Rail	5.95 6.93 7.91 9.87 9.87	
	Cent.	Rad.	444 2222 148	111 89	74 63½	65% 49	40%	- Land	Outer Rail	1.00 2.01 3.02 5.04	
	Point	No.	10200	410	92	ဆငာင္	AH I	1	Inner Rail	1.00 2.98 8.97 4.96	

26

	SWI	TCH ]	EASE	MENT	S 21/2-1	00. G	AGE.	4 FT.	8½ IN.
Point	Cent.		Inne	r Rail	ŝ	Length	Leneth	Correc-	
No.	Rad.	Angle	x	Y	ñ	Outer	Inner	T Rail	This Easement gives an O G equal
000	102%	6°-30' 5°-30'	0.643	11.818	6°-30'	11.876	11.342	010.	to and a G S 3.640 less than Spiral No 214
110	49 44½ 40½	8°-20	2.761 3.502	23.461	22°-00'	20.215 22.940 25.688	21.434 23.875	.029	
4	SWI	TCH 1	EASEN	MENT	S 21/2-2	200. G	AGE,	4 FT.	. 8½ IN.
oint	Cent.		Inne	r Rail		Tenoth	Lenoth	Correc-	
No.	Rad.	Angle	x	Y	ŝ	Outer	Inner	tion for T Rail	This Easement
2G	200 129	4°-00'	0.481 0.655	13.787	4°-00' 5°-00'	14.127 16.419	18.799	900.	gives an O G 0.250 greater and a G S
020	74 63%	2°-20	0.916	18.477 20.942	70-00/ 90-20/	21.766	21.000	.011	3.286 greater than Spiral No. 214
0.00	49	8°-00'	2.298	25.747 25.747	150-00	27.148 27.148	25.916 25.916	024	
11	40%	80-40'	3.842	30.387	220-00	32.617	80.809	.035	
1									

							1
	Correc- tion for T Rail		002	0216 024 044		Outer Rail	81.84 832.90 832.90 835.01 85.01 87.18
	Lenoth	Inner	5.195 10.849 15.461	20.533 25.564 30.553 35.153		Inner Rail	30.16 31.10 32.04 32.99 32.99 33.99 34.87 34.87
IN.	Lenoth	Outer	5.277 10.595 15.954	21.855 26.796 32.279 37.453	s.	Outer Rail	25.57 26.61 28.61 28.70 28.70 29.75 29.75 29.75
. 81/2	sine Sine I		)1745 )5234 0453	7365 5837 5837 5837 10947	M P.	Inner Rail	24.43 26.39 28.38 28.28 28.28 29.20
SPIRAL No. 3. GAGE, 4 FT			115 115 187 187 1.0	242 242 252 252 252 252 252 252 252 252	FRO	FRO Outer Rail 19.35	19.35 20.38 21.41 22.45 23.49 24.53
	S°		888	1.888	VCES	Inner Rail	18.65 19.62 20.59 21.55 23.51 23.47
			8833349000 883349000 8833490000000000000000000000000000000000		STAN	Outer Rail	18.18 14.21 15.23 16.26 17.29 18.32
	Rail	X	5.195     10.845     15.442	20.462 25.378 30.115 34.298	ID DI	Inner Rail	12.82 13.73 13.77 15.74 16.77 16.77 16.77
	Inner	x	0.046 0.226 0.626	$ \begin{array}{c} 1.332\\ 2.421\\ 3.962\\ 5.867 \end{array} $	E RC	Outer Rail	7.07 8.08 9.10 9.10 11.14 12.16
	Angle -		1°-0' 2°-0' 3°-0'	4°-0' 5°-0' 6°-0' 7°-0'	T	Inner Rail	6.98 7.92 8.90 9.88 11.84
	Cent.	Rad.	800 150	68848		Outer Rail	1.01 2.02 3.02 5.04 6.05
	Point 0 No.		02 00	410.05-		Inner Rail	2.98 3.97 5.95 5.95

5														
ż	Ease- gives an equal to t G S ess than No. 3.						Ease- gives an 0.250 0.250 2.853 2.853 2.853 No. 3.					·0 ·0.		
8½ Il	This	ment	O G and	4.391 1 Cnirol	npiide		8½ II	This	ment	0	greate	a b	Strand	manda
FT.	Correc- tion for T Rail		.010	.024	.044		FT.	Correc-	T Rail	.006	.009	.024	.033	.044
AGE, 4	Length	Inner	11.342 16.146	26.166	30.766		AGE, 4	Length	Inner	13.799	18.323	28.426	33.415	38.015
). GA	Length Outer		11.876	22.409	33.066		0. G.		Length Outer		18.817	29.658	35.141	40.315
S 3-100	ů		6°-30′ 10°-00′	15°-00'	28°-00'		S 3-20		ò	4°-00'	6°-00′	15°-00'	21°-00'	28°-00'
IENT	Rail	X	11.318	20.982	20.907	-	TUAL	Rail	X	13.787	18.295	28.226	32.968	37.151
EASEN	Innei	x	0.643	2.421	5.867		EASEN	Inner	X	0.481	0.876	2.671	4.212	6.117
TCH	Amolo	Angle	6°-30′ 3°-30′	5°-00'	,002	TCH		Angle	4°-00'	2°-00'	5°-00'	,009	,00- <u>°</u> 2	
SWI	Cent.	Rad.	10213	092	40		IWZ	Cent.	Rad.	200	132	60	20	40
	Point No.		4	100	-10			Point	No.		~ ~	4 xC	9	2

$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	T. 8½ IN.	Length Length Correc-	outer Inner T Rail	12322         5.100         5.102         .001           8664         10.349         10.177         .003           87824         10.349         10.177         .003           8187         30.537         30.537         .011           8224         20.812         20.537         .011           8255         31.392         30.184         .031           8256         31.392         30.184         .033           8545         36.724         35.114         .031	M P. S.	Inner Outer Inner Outer Rail Rail Rail	24.59 25.41 80.39 31.61 25.56 29.44 81.53 32.65 26.52 27.48 31.53 32.65 27.48 28.31 332.31 34.73 28.46 29.54 34.23 33.47 28.46 29.54 34.23 35.77 28.48 30.58 34.73
SPIRAL NO. 4. G.         Inner Rail         So           Rad.         Angle         Inner Rail         So           Rad.         Angle         Inner Rail         So           100         10-49/ 100         0.081         5.108         20-49/ 20-49/ 10.155         So           1100         29-49/ 100         0.155         10.175         20-49/ 2	AGE, 4 FJ	Transferre	Versine S 	000067 00087 000888 000888 000888 000888 000888 0008878 0008878 0008878 0008878 0008878 000878 000878 000878 000878 000878 00087 000087 00000000	NCES FRC	Inner Outer Rail Rail	18.75 19.75 20.70 20.70 21.67 21.67 21.67 22.64 23.38 23.64 23.38 23.64 23.38 23.64 23.38 23.49 23.38
SPIRAL I rent. Angle Inner Rad. Angle X 100 29-947 0.081 106 29-947 0.155 106 29-947 0.155 106 29-947 0.155 2007 29-947 0.155 2007 29-197 2007 29-197 2007 29-197 2007 29-197 2007 29-197 2007 29-197 2007 29-197 2006 2007 10.081 2006 29-077 0.155 2007 29-197 2008 2008 2008 2008 2008 2008 2008 2008	No. 4. G.	Rail	X	5.102         0°-42           10.175         2°-00           15.212         2°-01           20.203         2°-132           20.132         7°-02           21.132         10°-30           22.132         10°-30           23.6470         119°-30           24.679         119°-30	D DISTAI	Inner Outer Rail Rail	12.87         13.13           13.85         14.15           14.85         15.17           15.81         16.19           16.79         17.21           17.77         18.23
Centt. Radi. Ra	SPIRAL 1	Inner	ngle X	-42/ 0.081 -24/ 0.1155 -06/ 0.438 -48/ 0.155 -48/ 0.155 -88/ 0.488 -188 -188 -188 -188 -188 -188 -188 -	TIE RO	Inner Outer Rail Rail	6.95 7.945 8.98 9.07 9.92 10.90 11.10 11.89 12.11
		t Cent.	Rad. A	2200 2100 2100 200 200 200 200 20		er Outer 1 1 Rail	1.01 2.01 2.01 2.02 2.01 2.01 2.02 2.03 2.03 2.03 2.03 2.03 2.03 2.04 2.04 2.04 2.04 2.04 2.04 2.04 2.04

Cent.	America	Innei	r Rail	c U	Length	Length	Correc-	
Rad.	Angle	x	X	ò	Outer	Inner	T Rail	This Ease
200	4°-00'	0.481	13.787	4°-00'	14.127	13.799	.006	ment gives an
1251/2	3°-00′	1.099	20.203	,004	20.822	20.246	.011	greater and
84	3°-30'	1.859	25.132	10°-30′	26.096	25.234	.016	G S equal to
02	4°-12'	2.940	29.970	14°-42'	31.400	30.192	.023	Spiral No. 4.
60	4°-54′	4.394	34.679	19°-36'	36.733	35.123	.031	

	Correc-	TRail	.001 .008 .008 .008 .008 .0018 .018 .018	in the second	il Outer Aail	68 55 55 53 53 53 53 54 50 83.47 85.55 84.50 84.50 84.50 84.50 84.50 86.55 86.55 86.55	
	I Length	Inner	5.215 10.410 15.585 20.739 25.873 25.9757 25.9757 25.9757 25.9757 25.9757 25.9757 25.9757 25.9757 25.9757 25.9757 25.97577 25.97577 25.9757777 25.9757777777777777777777777777777777777		ter Inn vil Ra	28 30 30 33 33 33 33 33 33 33 33 33 33 33	
NI 2/1	Sine Length Outer		5.257 10.534 15.831 15.831 21.449 21.448 21.448 21.488 21.488 21.847 21.83	P. S.	ail Re	6.67 25.70 26.67 25.70 28.68 28.68 28.68 28.68 28.68 28.68 28.68 28.68 28.69 2	
5. GAGE, 4 FT. 8			00873 02618 05284 05284 08716 18053 18224 18224	ROM	uter In Rail R 9.17 24	20.19 20.19 22.23 22.23 24.26 24.26 24.26 24.26	
	Versin		.00004 .00034 .00137 .00381 .00381 .003856 .00856	CES I	Inner Rail	18.83 19.81 20.79 21.77 23.75 23.75 23.74	
	ŝ		00-30/ 55-00/ 10-30/ 110-30/ 140-30/ 140-30/	STAN	Outer Rail	13.09 14.10 15.12 16.13 17.14 18.16	
No. 5	r Rail	Y	5.215 10.409 15.580 20.721 20.721 20.873 80.873 85.805	ID DI	Inner Rail	12.91 13.90 14.88 15.87 15.87 16.86 17.84	
SPIRAL	Innei	х	.028 .118 .317 .676 1.235 8.084 8.105	IE RC	Outer Rail	7.08 8.04 9.05 10.06 11.07 12.08	
	Angle		00-30 10-30 20	E	Inner Rail	6.97 6.97 8.95 9.94 10.98 11.92	
	Cent.	Rad.	38800 1120 880 800 1120 880 800 880 800 800 800 800 800 800 8		Outer Rail	2.01 2.01 5.02 6.03 6.03	
	Point No.		H0041005-		Inner Rail	1.00 8.99 5.97	
ter Kail							
----------------	--------	----------	---------------------				
So	Length	Length C	rrec- n for				
X I	Outer	Inner	Rail This Ease				
13.787 4°-00'	14.127	13.799	006 ment gives an				
16.253 5°-00′	16.681	16.271	008 and a G S				
21.355 7°-30'	22.020	21.404	012 4.468 less than				
26.405 10°-30'	27.379	26.517	016 Spiral No. 5.				
31.337 14°-00′	32.715	31.565	022				

		SPI	IRAL	No.		AGE,	4 FT	. 81/2	N.		
oint	Cent.	America	Inne	r Rail	ő	Trant			ength	Length	Correc-
No.	Rad.	arânv	x	X	2	A GLSL		en	Outer	Inner	T Rail
100041002	900 450 300 225 180 1128 1128 1128	$0^{\circ} - 30^{\circ} - 30$	0.015 0.076 0.212 0.458 0.828 1.367 2.094	5.222 10.431 15.624 20.799 25.953 31.078 86.142	80-00 82-000 82-0000 82-0000 82-0000 82-000 82-000 82-0000 82-0000 8	8800 10000 10000 10000 10000	20101010	6682 745 4190 814 814 811 818 218 218	5,250 10,518 15,790 21,081 281,704 87,012 87,012	5.222 10.431 15.625 20.826 20.875 25.975 31.128 31.128 36.246	.001 .002 .003 .005 .005 .001 .011
-		E	IE RC	ID DI	ISTAN	VCES	FRO	M P	s.	-	
nner Rail	Outer Rail	Inner Rail	Outer Rail	Inner Rail	Outer Rail	Inner Rail	Outer Rail	Inner Rail	Outer Rail	Inner Rail	Outer Rail
2.99 2.99 5.99 5.99	2.01 2.01 5.01 6.03 6.03	6.98 7.97 8.97 9.96 10.95 11.95	7.02 8.03 9.03 10.04 11.05 12.05	12.94 13.93 14.92 15.91 16.90 17.89	13.06 14.07 15.08 16.09 17.10 18.11	18.88 20.86 21.85	19.12 20.13 21.14 23.15 23.16 24.18	24.81 25.80 26.78 27.77 28.75 28.75 28.75 28.75	25 19 26.20 28.22 29.25 29.25 29.25 29.25	30.73 31.70 33.66 33.66 34.66 35.63	81.28 83.39 85.38 85.38 86.38 87.38 86.38
									-		

Ń		This Ease-	ent gives an G equal to	d a G S	rruless than biral No. 6.		FIGNS -	
T. 8½	Correc-	T Rail	.006 O	.008 an	.011 St	.015		
E, 4 ]	Length	Inner	13.799	18.208	23.361	28.479		
GAG	Leneth	Outer	14.127	18.618	23.937	29.245		
6-200.		ŝ	4°-00'	2°-00′	,002	9°-20′		
ENT	Rail	Y	13.787	18.183	23.308	28.372		
ASEMI	Inner	x	0.481	0.828	1.367	2.094	in the second	
CH E		Angle	4°-00'	1°00'	2°-00'	2°-20'		
LIMS	Cent.	Rad.	200	255	150	128	- State	
	Point	No.		2	9	2		

oint Ce	nt.	Inner	Rail	Go	Tradino	C tao	Length	Lengtl	Correc-
Io. Ré	id. Angle	x	Y	2	V ersine	ALLO	Outer	Inner	T Rail
10040 00100 00100	2000 2000 2000 2000 2000 2000 2000	0.011 0.056 0.157 0.332 0.608	2.596 5.170 7.720 10.245	00-80 50-00 50-00 70-30	.00004 .00034 .00137 .00137 .00381	.00873 .02618 .05234 .08716 .13053	2.640 5.801 7.985 10.690 13.417	2.596 5.171 7.723 10.254 12.763	.005 .005 .005 .005 .005 .005 .012
0.00 fr 00 0.00 4 60 60	21/2 200 21/2 200 39/3 20-00/ 39/3 20-00/ 39/3 20-00/	0.994	15.195 17.582 19.930	10°-30' 14°-00' 18°-00'	01675	. 18224 . 24192 . 30902	16.166 18.915 21.707	15.250 17.698 20.137	.022 .022 .028
	T	TE RO	D DIS	STAN	CES FF	I MOS	P. S.		
ner Rail	Outer Rail	I Inner R	ail Oute	r Rail	Inner Rail	Outer Ra	vil Inne	r Rail	Outer Rail
2.99 2.97 3.96 4.94	1.01 2.02 8.08 4.04 5.06	9.80 80 80 80 80 90 80 80 80 80 80 80 80 80 80 80 80 80 80	96.000		10.76 11.72 13.68 13.68 14.58	11.24 12.28 13.28 13.32 14.87 15.42		5.53 5.47 7.41 7.41 5.34	16.48 17.53 19.66 20.72

SEMENT S 2-75. GAGE, 5 FT.	kail Length Length Correc-	Y Outer Inner Trail This Ease-	9.881 7°-50' 10.596 9.912 .012 O G equal to	11.849 10°-30′ 12.822 11.906 .016 3.346 less than	14.236 14°-00′ 15.571 14.349 .022 Spiral No. 2.	$16.584$ $18^{\circ}-00'$ $18.363$ $16.793$ .028
H EA	Inner	x	.677	.994	1.513	2.187
SWITC		Angle	7°-50'	2°-40'	3°-30'	4°-00'
	Cent.	Rad.	75	45 1/3	42 1/2	37 1/2
LEVA	Point	No.		9	2	8

Der Rail         So         Versine         Sine         Length         Length         Correction           Y         Y         S         Versine         Sine         Length         Length         Correction           Y         S         P<-20'         00003         00553         S.210         Tono         S.510         Tono           5.1568         P<-20'         00003         00546         S.210         Tono         Tono           10.1573         P<-00'         00013         00546         S.210         5.200         0003           113.469         P<-00'         00013         0046         T.880         0.003         0.003           113.6173         P<-00'         00031         0046         13.47         10.87         0.003           113.6173         P<-00'         00331         0.014         10.88         0.016         0.016           20.066         192.40'         0.0235         32.980         15.199         0.019         0.019           20.066         192.40'         0.0235         37.40'         29.46'         0.026         0.026           20.066         192.40'         10.88'         118.47'         20.68'         0.026			SPIR	AL N	0. 21/2	GA	GE.	FT -			
Y         D         Veraue         Date         Outer         Inner         Unter         Unter <thunter< th=""> <thunter< th="">         Unter<th>Andle</th><th>T</th><th>nne</th><th>r Rail</th><th>00</th><th>Transfer</th><th></th><th>I</th><th>ength</th><th>Length</th><th>Correc-</th></thunter<></thunter<>	Andle	T	nne	r Rail	00	Transfer		I	ength	Length	Correc-
2         5         9         90         10005         10745         5         90         00005         10745         5         90         00005         10745         5         90         00005         10745         5         90         00005         10745         5         90         00005         10745         5         90         00005         100         10005         1005	X	X		Y	2	A GENTING		a	Outer	Inner	T Rail
7.661         29-00'         00061         09440         7.860         7.660         0.005         7.660         7.660         0.005         7.660         0.005         7.660         0.005         7.660         0.005 <t< td=""><td>00-20' .000</td><td>.00.</td><td>200</td><td>2.568</td><td>0°-20'</td><td>.00002</td><td>500<sup>.</sup></td><td>82 45</td><td>2.598 5.210</td><td>2.568</td><td>0.000</td></t<>	00-20' .000	.00.	200	2.568	0°-20'	.00002	500 <sup>.</sup>	82 45	2.598 5.210	2.568	0.000
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	10-20 0.222	0.108		7.661	2°-20'	0000169	.034	90	7.836	7.662	0.008
17.683         9°-90' 20.006         .00183         .10818         .10818         .10818         .10818         .10818         .0016         0.019         0.019           28.400         198-00'         0.0185         28771         28.183         28.183         29.265         0.019           28.401         198-00'         0.0316         28.683         28.683         28.683         0.035           28.417         289-00'         .03076         31444         29.893         25.683         0.035           28.407         .07383         .37401         29.893         25.683         0.035           27.001         289-00'         .07383         .37401         29.583         0.035           29.406         29.593         27.400         0.035           29.407         29.289         25.68         0.035           20.016         289-00'         .07383         27.400         0.035           21.11         Rail         Rail         Rail         Rail         Rail         Rail           10.84         11.16         18.40         21.54         20.46         21.54         20.63           11.618         11.618         16.89         21.54         21.54	20-00' 0.665	0.665		15.173	20-00	.00381	121.	87	15.809	12.703	0.008
92: 450         15: -00         06007         25: 680         25: 680         25: 680         25: 680         0.003           24. 761         19: -20'         05076         31454         29: 669         25: 669         0.003           27: 046         220 -00'         07389         35: 689         25: 689         0.003           27: 046         220 -00'         07389         37401         20: 600         0.003           20: 040         07389         37401         29: 389         25: 688         0.003           27: 040         220 -00'         07389         35: 689         25: 686         0.003           20: 040         07389         37401         27: 07         20: 94         0.035           11: 61         12: 19         19: 49         23: 39         27: 07         29: 38           13: 76         19: 49         29: 49         24: 25         26: 68         26: 68	2°-20' 1.018 2°-40' 1.474	1.018		17.633	90-20	.01324	.162	18	18.497	17.683	0.015
27:046         20-00         77461         20:890         27:400         0.085           OD DISTANCES FROM P. S.         37:461         20:890         27:400         0.085           OD BISTANCES FROM P. S.         Inner lane         Inner lane         Outer         Inner lane         Outer         Rail         <	8°-20' 2.043 8°-20' 2.743	2.043		22.423	15°-00'	.08407	2556	1882	23.898 29.698	222.585 987.098	0.024
DD DISTANCES         FROM         P.         S.           Inner         Outer         Inner         Outer         Inner         Outer           Rail         Rail         Rail         Rail         Rail         Rail         Rail           10.84         11.16         15.68         16.38         20.46         21.51         20.46         21.61           13.76         13.29         17.60         18.40         22.36         28.64         27.67         28.38           13.76         13.65         20.46         21.61         28.36         28.16         27.67         28.38           14.77         15.28         19.46         24.35         28.76         27.67         28.38	8°-40' 3.581	3.581		27.046	220-00	.07282	374	61	29.380	27.460	0.035
Inner         Outer         Inner         Outer         Inner         Outer         Inner         Outer         Rail	TIE RO	IE RO		Id do	ISTAN	ICES ]	FROJ	M P.	ŝ		
10.84         11.16         15.68         16.32         20.46         21.54         25.19         20.81           11.81         12.19         16.64         17.36         21.41         22.55         26.18         27.67           11.81         12.19         18.64         17.36         21.41         22.55         26.18         27.67           13.76         18.25         19.45         23.30         24.76         24.76         28.33           13.77         15.20         19.45         23.30         24.76         27.67         28.33           14.77         15.30         19.51         20.49         24.35         33.76         34.70	Inner Outer Rail Rail	Outer Rail		Inner Rail	Outer Rail	Inner ( Rail	Outer Rail	Inner Rail	Outer Rail	Inner Rail	Outer Rail
	5.94         6.06           6.98         7.07           7.91         8.09           8.89         9.11           9.86         10.14	6.06 7.07 8.09 9.11		10.84 11.81 12.78 13.75 14.71	11.16 12.19 13.23 14.25 15.29	15.68 18.64 17.60 18.55 19.51	16.32 17.36 18.40 19.45 20.49	20.46 21.41 22.36 23.30 24.25	21.54 22.59 23.64 23.64 23.75 23.75 23.75	25.19 26.13 27.07	26.81 27.87 28.98

		lent	a G han	2.		N E	lent	0 G and	eat- biral		
FT.		This Easen	equal to and S 3.640 less t	Spiral No. 25	FT.		This Easen	gives an C 0.250 greater	a G S 8.256 gr er than Sp	No. 2½.	
GE, 5	Correc-	T Rail	010.	.029	GE, 5	Correc-	T Rail	800. 800.	.011	.019 024	089
. GA	Length	Inner	11.825	21.387 23.819	. GA	Length	Inner	13.788 15.996	18.492 20.976	23.442	28.321
2 <sup>1/2</sup> -100	Length	Outer	11.898	22.987 25.739	21/2-200	Length	Outer	14.138 16.432	21.790	24.490	29.921 32.673
S LN		20	6°-30' 12°-00'	18-20 22°-00'	S TN	00	2	4°-00' 5°-00'	7°-00'	15°-00	18°-20'
SEMEI	Rail	Y	11.301 16.416	21.124 23.406	SEME	Rail	Y	18.777	20.919	25, 709	28.050 30.332
H EA	Inner	X	0.642	2.743 2.743 3.581	H EA	Inner	x	0.481 0.654	0.915	2.293	2.993 3.831
WITC		Angle	6°-30' 5°-30'	3°-20' 3°-40'	WITC		Angle	4°-00' 1°-00'	2°-20'	20-40' 30-00'	30-20
S	Cent.	Rad.	102%	44% 40%	S	Cent.	Rad.	200 129	74 631/2	65½ 49	44½ 40%
	Point	No.	000	911 8		Point	No.	Q	02-1	000	91

UNIVERSITY

CALIFORNI

		10.02									
Point	Cent.	Andle	Inne	r Rail			-	-	enoth	Lenoth	Correc-
No.	Rad.	DISTU	X	Y	ŝ	Versin	e N	ne	Outer	Inner	tion for T Rail
- 38	300 150	1°-00'	0.046	5.192 10.337	1°-00' 3°-00'	.00015	10.20	745 234	5.280 10.608	5.192	.002
20 4 1	222	8°-00'	0.625	20.437	10°-00'	.01519	21.	453	21.380	15.446 20.508	000. 910.
400	324%	00-00-00-00-00-00-00-00-00-00-00-00-00-	2.416 3.952 5.850	25.335 30.063 34.229	210-00	.03407 .06642 .11705	88. <del>4</del>	882 837 947	26.834 32.332 37.524	25.526 30.500 35.082	.024 .033 .044
-	2	E	IE RC	Id do	STAN	ICES	FRO	M P	Ś		
nner Rail	Outer Rail	Inner Rail	Outer Rail	Inner Rail	Outer Rail	Inner Rail	Outer Rail	Inner Rail	Outer Rail	Inner Rail	Outer Rail
2.98 3.97 3.97 3.97 3.97 3.98	1.01 3.02 3.02 5.04 6.06	6.93 9.88 10.86 11.83	7.07 8.09 9.11 10.12 11.14	12.81 13.78 15.73 16.70 16.70	13.19 14.22 15.24 15.24 16.27 17.30	18.63 20.56 21.55 21.55 22.45 22.45 23.44 24.45 25.44 25.44 25.44 25.44 25.44 26.44 26.44 26.44 26.44 26.44 26.44 26.44 27.44 26.44 27.44	19.87 20.40 21.44 23.52 23.52 23.52	24.40 25.35 27.26 28.21 28.21 28.21 28.21	26.60 28.66 287.69 287.74 28.774 28.774 29.774	80.11 81.99 82.98 82.88 82.88 82.88 82.88 82.88 82.88	88.98 88.98 88.01 88.98 89.98 89.98 80 80 80 80 80 80 80 80 80 80 80 80 80

		-					-
	Correc-	T Rail	000 000 000 0016 0110 016 0180 0180		Outer Rail	31.65 33.69 33.78 34.78 35.83 35.83	
at in	Length	Inner	5.100 10.171 15.211 20.220 30.147 35.064		Inner Rail	80.35 31.31 32.27 33.22 34.18	
No.	ength	Outer	5.162 10.855 15.577 15.577 20.880 20.114 31.429 36.774	Ś	Outer Rail	25.44 26.47 26.47 28.54 28.54 29.58 30.61	
FT.	I	p	82 4 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	M P	Inner Rail	24.56 25.58 26.49 27.46 28.42 28.42 29.39	
E. 5	Cit	TIC	.012 .038 .038 .038 .038 .038 .038 .038 .038	FROI	Duter Rail	19.27 20.29 21.32 22.35 23.38 24.41	
GAG	Wonsing	A GI STING	.00007 .00067 .00269 .00745 .01675 .01675	CES 1	Rail (	20.68 20.68 21.66 22.65 23.59 23.59	
0. 4.	ŝ	2	$\begin{array}{c} 0^{\circ}-42'\\ 2^{\circ}-06'\\ 7^{\circ}-00'\\ 10^{\circ}-30'\\ 14^{\circ}-42'\\ 19^{\circ}-38'\end{array}$	TAN	Duter Rail	18.14 14.16 15.18 16.20 17.22 18.24	
AL N	Rail	Y	<b>5.100</b> <b>10.169</b> <b>15.201</b> <b>25.105</b> <b>25.105</b> <b>25.105</b> <b>29.983</b> <b>34.630</b>	D DIS	Inner Rail	12.86 13.84 15.80 15.80 16.78 17.76	
SPIR	Inner	x	0.031 0.155 0.432 0.432 0.930 1.678 2.757 4.207	E RO	Outer Rail	7.05 8.06 9.08 10.09 11.11 12.12	
	Anoto	arguy	0°-42' 1°-24' 2°-06' 3°-30' 4°-12' 4°-54'	IT	Inner Rail	6.95 7.94 8.92 9.91 11.88	
	Cent.	Rad.	- 210 - 210 - 210 - 210 - 220 - 20 -	- 29	Outer Rail	1.01 2.01 3.02 5.08 6.04	•
	Point	No.	<b>₩6300 41000</b> 5≁	1.0	Inner Rail	0.99 1.99 3.98 3.98 5.96	

Cen			Inner	Rail	2	Length	Leneth	Correc-	
Rad		Angle	×		ñ	Outer	Inner	T Rail	This Ease
200	4	t°-00'	0.481	13.777	4°-00′	14.138	13.788	.006	0 G 0.17
125	1/2 5	,008	1.098	20.185	,002	20.839	20.229	.011	greater and
84		3°-30'	1.856	25.105	10°-30'	26.123	25.207	.016	to Spiral No
02	4	t°-12'	2.935	29.933	14°-42′	31.437	30.155	.023	4.
60	4	t°-54'	4.385	34.630	19°-36'	36.783	35.073	.031	

	6		1.1.1		1	
	Correc	T Rai	.001 .005 .005 .012 .016		Oute Rail	33.44 33.44 33.44 35.56 36.56 36.56 36.56
	Length	Inner	5.214 5.214 15.577 20.726 25.853 35.997 35.997		Inner Rail	20.55 21.53 23.50 23.50 23.47 24.45 24.44 25 24.44 25 25 25 25 25 25 25 25 25 25 25 25 25
	ength	Outer	5.258 0.537 5.839 5.839 11.162 86.507 11.874 11.874	s.	Outer Rail	25.30 26.32 28.37 28.37 28.37 28.37 29.40 30.42
FT.	L	) all	0873 2618 2618 2618 2716 2234 2716 2224 2053 2224 3716 2224 3716 2224 3716 2224 3716 3716 3716 3716 3716 3716 3716 3716	M P.	Inner Rail	24.70 26.65 28.66 28.68 28.60 28.60 29.58
GE, 5	0	e en	2382322	FRO	Outer Rail	19.19 20.20 21.22 22.24 23.26 24.28
GA	Tran	A GI S	0000. 1000. 1000. 1000. 1000. 1000. 1000. 1000.	VCES	Inner Rail	18.81 19.80 20.78 21.76 23.74 23.73
0. 5.	ő	6	00-30/ 30-00/ 50-00/ 10-30/ 14-00/ 14-00/	STAN	Outer Rail	18.10 14.11 15.12 16.14 17.15 18.17
AL N	Rail	X	$\begin{array}{c} 5.214\\ 15.572\\ 15.572\\ 20.708\\ 25.804\\ 30.846\\ 35.769\\ 35.769\\ \end{array}$	ID DI	Inner Rail	12.90 14.88 15.86 17.88 17.83
SPIR	Inner	х	.023 .118 .317 .675 1.234 2.031 3.101	E RC	Outer Rail	7.04 8.04 9.05 11.07 11.07
	Andle	argure	$\begin{array}{c} 0^{\circ}-30'\\ 1^{\circ}-30'\\ 2^{\circ}-30'\\ 2^{\circ}-30'\\ 3^{\circ}-30'\\ 3^{\circ$	IT	Inner Rail	6.96 7.96 8.95 9.94 11.92 11.92
	Cent.	Rad.	800 800 1120 1120 1120 1120 1120 1120 11		Outer Rail	2.01 3.01 5.02 6.03 6.03
	Point	No.	10041005-	-	Inner Rail	1.00 3.98 3.98 5.99

T.	This Reco.	ment gives an O G equal to	and a G S	4.468 less than Sniral No 5	o ou muido		
1, 5 F	Correc- tion for T Rail	.006	.008	.012	.016	.022	
GAGE	Length Inner	13.788	16.258	21.385	26.490	31.529	
-200.	Length Outer	14.138	16.694	22.039	27.406	32.751	
UT S 5	ŝ	4°-00'	5°-00′	7°-30′	10°-30'	14°-00'	
SEMEN	Rail	13.777	16.240	21.336	26.378	31.301	
H EA	Inner	0.481	0.675	1.234	2.031	3.101	
WITC	Angle	4°-00′	1°00'	2°-30′	3°-00'	3°-30'	
S	Cent. Rad.	200	144	120	100	85	
	Point No.		4	20	9	1-	

6

-

	Correc-	T Rail	.001 008 008 008 008 011 015		Outer Rail	81.80 82.82 83.84 85.87 85.87 85.87 85.87	
	ength	Inner	5.221 10.428 15.621 20.799 25.962 31.111 36.222		Inner Rail	30.70 81.68 32.66 33.64 33.64 33.64 35.61	
	ength 1	uter	5.251 0.516 5.795 6.795 6.898 6.898 1.721 7.086	S.	Outer Rail	25.20 26.22 28.25 29.28 20.28	
FT.	ľ		2882 2455 2455 214 2187 2187 2187 218 218 218 218 218 218 218 218 218 218	M P.	Inner Rail	26.778 26.778 26.778 28.778 28.778 28.778 28.778	
GE, 5	C		00000000000000000000000000000000000000	FRO	Outer Rail	19.12 20.18 21.15 22.16 23.17 24.19	
GA	Tone	ICTO A	0000 00016 0016 0016 0016 0018 0018 0028	ICES	Inner Rail	18.88 20.85 20.85 21.84 20.85 21.84 20.85 21.84 20.85 20.85 20.85 20.85 20.85 20.85 20.85 20.85 20.85 20.85 20.85 20.87	
0. 6.	00	2	$\begin{array}{c} 0^{\circ} - 20^{\circ} \\ 2^{\circ} - 00^{\circ} \\ 7^{\circ} - 00^{\circ} \\ 7^{\circ} - 00^{\circ} \\ 9^{\circ} - 20^{\circ} \end{array}$	STAN	Outer Rail	13.06 14.07 15.08 15.08 16.09 18.11	
AL N	Rail	Х	5.221 10.428 15.619 20.791 25.040 25.940 31.060 36.119	D DI	Inner Rail	12.94 18.98 14.92 15.91 16.90 17.89	
SPIR	Inner	х	$\begin{array}{c} 0.015\\ 0.076\\ 0.211\\ 0.453\\ 0.828\\ 1.366\\ 1.366\\ 2.092\end{array}$	E RC	Outer Rail	7.02 8.03 9.04 11.05 12.06	
	Andla	DISINU	$\begin{array}{c} 0^{\circ}-20'\\ 0^{\circ}-40'\\ 1^{\circ}-20'\\ 1^{\circ}-20'\\ 2^{\circ}-20'\\ 2^{\circ$	E	Inner Rail	6.98 7.97 8.96 9.96 11.94	
	Cent.	Rad.	900 450 800 1120 112%		Outer Rail	2.01 2.01 5.01 5.01 6.02 6.02	
	Point	No.	H004005-		Inner Rail	1.00 2.99 3.99 5.98	

THE PENNSYLVANIA STEEL COMPANY

				2				
Cent.		Inner	. Rail	e D	Length	Length	Correc-	
Rad.	Angle	×	X	2	Outer	Inner	T Rail	This Ease- ment gives an
200	4°-00'	0.481	13.777	4°-00'	14.138	13.788	.006	O G equal to
255	1°-00′	0.828	18.170	2°-00′	18.631	18.195	.008	7.770 less than
150	2°-00'	1.366	23.290	,00- <u>°</u> 2	23.954	23.344	.011	Spiral No. 6.
128	2°-20'	2.092	28.349	9°-20'	29.269	28.455	.015	

				-	1		II		
	Correc	T Rai	.001 2000 2000	012	0.028		Outer Rai	16.49 17.56 18.62 19.68 20.75	
	Length	Inner	2.595 5.168 7.718	10.245 12.749	20.104		r Rail	22 22 22 22 22 22 22 22 22 22 22 22 22	
IN.	ength	Outer	2.641 5.304 7 000	10.699 13.431	21.740	S.	Inne	198165	
FT. 21/2	Cino I	ALLIC	.02618 .02618	.13053	24192	KOM P	Outer Rail	11.25 12.20 13.28 13.84 15.44	1.
GE, 5	Wonsing		.00004 .00084	00881	.02970	CES FF	inner Rail	10.75 11.70 12.66 13.61 14.56	
GA	ů	6	0°-30'	20-00 20-80	14°-00′	STAN	r Rail	000 111 118 118 118 118 118	
lo. 2.	ail	Y	2.595 5.167 7 715	10.236	17.557	ID (	Oute		
SAL N	Inner R	x	0.011 0.056 0.156	0.832	2.182	E ROD	Inner Rai	5.91 6.88 8.88 9.79 9.79	
IIdS	Andle	aigua	0°-30′ 1°-00′ 1°_30′	\$°-90	3°-30' 4°-00'	IT	)uter Rail	1.01 2.02 3.03 3.03 5.06 5.06	
	Cent.	Rad.	300	283	42% 87% 83%		Rail C		
	Point	No.	H 68 65	0410¢	00-30		Inner	20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0	

Cent.	Anoto	Inner	Rail	00	Length	Length	Correc-	
Rad.	212111	x	Y	2	Outer	Inner	T Rail	This Ease- ment gives an
75	7°-50'	.676	9.867	7°-50'	10.610	9.898	.012	O G equal to
451%	2°-40'	.992	11.830	10°-30'	12.841	11.887	.016	3.346 less than
42 1/2	3°-30'	1.510	14.211	14°-00'	15.596	14.324	.022	Spiral No. 2.
37 1/2	4°-00'	2.182	16.552	18°-00'	18.396	16.760	.028	

					_	-					-
	Correc-	tion for T Rail	0.000	0.005	0.011	0.019	0.085		Outer Rail	26.84 27.91 28.97	
	Leneth	Inner	2.568	10.180	15.186	20.128	24.995		Inner Rail	25.16 26.09 27.08	
NIN.	eneth	Juter	2.598	7.840	140 15.822 15.822	21.218	26.661	s.	Outer Rail	21.56 22.62 23.67 24.73 24.73 25.78	
T. 2 <sup>1</sup> / <sub>7</sub>	Ĩ	en	582 745	814	187	1791	454	M P.	Inner Rail	20.44 21.38 22.83 28.27 24.22	
5 F	-	20 De	88 00 010	500 500	120.12	2002	32 28 28 28	FRO	Outer Rail	16.84 17.88 18.42 19.47 20.51	
AGE	1	Vers	0000	000	2000	02180	.0726	VCES	Inner Rail	15.66 16.63 17.58 18.58 19.49	
2. 0	5	'n	0°-20	30-20	00-02-00	120-00	220-00	STAN	Outer Rail	11.17 12.20 13.23 14.27 15.30	
Vo. 24	: Rail	Х	2.568	10.177	15.161	20.085	24.731	ID DI	Inner Rail	10.83 11.80 12.77 18.77 18.77 14.70	
AL N	Innei	х	0.007	0.222	0.665	1.472	2.788	E RC	Outer Rail	6.06 7.08 8.10 9.12 9.12 10.14	
SPIR		Angle	0°-20'	10-20	20-00	20-40V	3°-20' 3°-40'	IT	Inner Rail	5.94 6.92 7.90 8.88 9.86 9.86	
	Cent.	Rad.	444 222	111	74	62/2 2/2 2/2	44% 40%		Outer Rail	1.01 2.01 3.02 4.08 5.04	
	Point	No.	02 0	044	100	• 00 ct	110		Inner Rail	1.99 2.98 3.97 4.96	

. 2½ IN.	This Easement	egual to and a G egual to and a G S 3.640 less than Spiral No. 2%.	2½ IN.		This Easement	gives an O G 0.200greaterand a G S 3.286 greater than Spiral No. 2%.
5 FT	Correc- tion for T Rail	.010 .019 .024 .039	5 FT.	Correc-	T Rail	.008 .011 .011 .024 .023 .023
AGE.	Length Inner	11.314 16.488 18.917 21.354 23.779	AGE,	Length	Inner	18.781 15.987 18.479 20.959 23.421 23.421 25.850 28.288 28.288 28.288 28.288 28.288 28.288
.00. G	Length Outer	11.904 17.578 20.281 23.020 25.779	00. G	Length	Outer	14.145 16.441 19.115 21.807 24.511 27.214 29.954 29.954 29.954
S 21/2-1	ŝ	6°-30' 12°-00' 15°-00' 18°-20' 22°-00'	S 21/2-2	02	'n	4°-00' 5°-00' 7°-00' 12°-00' 15°-00' 18°-20' 22°-00'
TENT	r Rail Y	11.289 16.395 18.756 21.091 23.368	IENT	Rail	Y	13.769 15.969 18.447 20.902 23.321 25.682 25.682 25.682 25.682 29.294
EASEN	Inner	0.641 1.472 2.039 2.738 8.573	EASEN	Inner	X	0.481 0.654 0.915 1.207 1.722 2.289 2.289 8.823
LCH	Angle	6°-30′ 5°-30′ 3°-20′ 3°-40′ 3°-40′	CH I		Angle	20-00 20-00 20-00 20-00 20-00 20-00 20-00
IMS	Cent. Rad.	102% 56% 449 40%	LIMS	Cent.	Rad.	200 74 63% 63% 63% 49 44% 40%
	Point No.	88 01 11		Point	No.	7000001 1000001

$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$			SPJ	IRAL	No. 3	. G <i>l</i>	AGE.	5 FT	. 21/2	IN.		
No.         Rad.         Auge         X         Y         Set to the state         Y         Set to the state         Set to the state	Point	Cent.	And	Inne	r Rail	00		5	1	eneth	Length	Correc-
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	No.	Rad.	Augue	x	Y	2	V CISI	en la	не (	Outer	Inner	T Rail
THE ROD DISTANCES FROM P. S.           THE ROD DISTANCES FROM P. S.           Inner         Outer         Inner         Outer         Inner         Nail         Rail	1004536	800 100 100 100 100 100 100 100 100 100	20-00 20-000 20-00 200 2	$\begin{array}{c} 0.046\\ 0.225\\ 0.825\\ 0.625\\ 1.328\\ 2.413\\ 8.945\\ 5.838\end{array}$	5.191 10.882 15.416 20.419 20.808 34.181 34.181	22 22 22 22 22 22 22 22 22 22 22 22 22	.0001 .0013 .00540 .0151 .0151 .0340 .0340	682876 682811000	745 234 865 882 882 882 882 887 887 887 887 887 887	5.281 5.281 10.608 15.981 21.399 26.862 26.862 27.576	$\begin{array}{c} 5.191\\ 5.191\\ 15.435\\ 20.489\\ 25.498\\ 30.461\\ 35.030\\ \end{array}$	.005 .005 .009 .016 .024 .033
Inner         Outer         Inner         Inner         Inner         Inner <th< td=""><td>1</td><td></td><td>T</td><td>TE R(</td><td>D D</td><td>ISTAI</td><td>NCES</td><td>FRO</td><td>M P.</td><td>s.</td><td></td><td></td></th<>	1		T	TE R(	D D	ISTAI	NCES	FRO	M P.	s.		
.99         1.01         6.92         7.08         13.20         18.61         19.39         24.37         25.63         30.07         3           2.97         3.08         7.91         8.00         13.77         14.28         19.56         20.42         25.33         30.07         3           3.97         3.08         9.11         14.75         15.25         20.54         21.46         21.46         31.01         3           3.97         3.08         9.11         14.75         15.25         20.54         21.46         25.33         36.67         31.01         3           3.97         3.08         9.11         14.75         15.25         20.54         21.46         25.33         36.67         31.01         3           4.08         9.57         10.13         16.728         20.54         21.76         27.33         28.76         31.01         3         4         36.54         31.01         31.44         32.54         33.54         33.54         33.54         33.54         33.54         33.54         33.54         34.75         33.54         34.75         33.51         5         5         5         5         5         35.18         34.75	Inner Rail	Outer Rail	Inner Rail	Outer Rail	Inner Rail	Outer Rail	Inner Rail	Outer Rail	Inner Rail	Outer Rail	Inner Rail	Outer Rail
	$\begin{array}{c} 1.99\\ 2.97\\ 3.97\\ 5.94\\ 5.94\end{array}$	1.01 3.03 3.03 5.04 6.06	6.92 6.93 9.87 9.87 10.85 11.85	7.08 8.09 9.11 10.13 11.15 12.18	12.80 13.77 14.75 15.75 16.68 17.65	13.20 14.23 15.25 16.28 17.32 18.35	18.61 19.58 20.57	19.39 20.42 22.56 23.55 23.55 23.55 23.55 24.55 24.55 24.55 24.55 24.55 24.55 25 25 25 25 25 25 25 25 25 25 25 25 2	24.37 25.38 26.28 27.22 27.22 27.22 27.22 27.22 27.22 27.22 27.17 29.12	25.63 27.73 28.73 28.83 29.83 29.83 29.83 29.83 20.83 20.83 20.83 20.83 20.83 20.83 20.83 20.83 20.63	80.07 81.91 82.88 83.88 83.88 83.88 83.88 83.88 84.75	81.98 82.99 85.19 87.25 87.25

2½ IN.	This Ease- ment gives an	O G equal to and a G S 4.891 less than Spiral No. 3.	2½ IN.	This Ease- ment gives an	O G 0.250 greater and a G S 2.853 greater than Spiral No. 3.
FT.	Correc- tion for T Rail	$\begin{array}{c} .010\\ .016\\ .024\\ .033\\ .033\\ .044\end{array}$	FT.	Correc- tion for T Rail	.006 .009 .016 .024 .033 .044
AGE, 5	Length Inner	$\begin{array}{c} 11.314\\ 16.102\\ 21.111\\ 26.075\\ 30.643\end{array}$	AGE, 5	Length Inner	$\begin{array}{c} 13.781 \\ 18.297 \\ 28.351 \\ 28.360 \\ 33.324 \\ 37.892 \end{array}$
). G/	Length Outer	$\begin{array}{c} 11.904\\ 17.012\\ 22.475\\ 27.983\\ 33.189\end{array}$	0. GA	Length Outer	$\begin{array}{c} 14.145\\ 18.843\\ 24.261\\ 29.724\\ 35.232\\ 40.438\end{array}$
S 3-100	ŝ	$\begin{array}{c} 6^{\circ}-30'\\ 10^{\circ}-00'\\ 15^{\circ}-00'\\ 21^{\circ}-00'\\ 28^{\circ}-00'\\ 28^{\circ}-00'\\ \end{array}$	S 3-20	å	$\begin{array}{c} 4^{\circ}-00'\\ 6^{\circ}-00'\\ 10^{\circ}-00'\\ 15^{\circ}-00'\\ 21^{\circ}-00'\\ 28^{\circ}-00'\\ 28^{\circ}-00'\\ \end{array}$
IENT	Rail	$\begin{array}{c} 11.289\\ 16.028\\ 20.917\\ 25.635\\ 29.790\end{array}$	IENT	Rail Y	$\begin{array}{c} 13.769\\ 18.269\\ 23.272\\ 28.161\\ 32.879\\ 37.034\\ \end{array}$
EASEN	Inner X	$\begin{array}{c} 0.641 \\ 1.328 \\ 2.412 \\ 3.945 \\ 5.838 \end{array}$	EASEN	Inner X	$\begin{array}{c} 0.481\\ 0.875\\ 1.578\\ 2.662\\ 4.195\\ 6.088\end{array}$
TCH	Angle	6°-30′ 5°-00′ 6°-00′ 7°-00′	TCH	Angle	$\begin{array}{c} 4^{\circ}-00'\\ 2^{\circ}-00'\\ 5^{\circ}-00'\\ 6^{\circ}-00'\\ 7^{\circ}-00'\\ 7^{\circ}-00'\\ \end{array}$
SWI	Cent. Rad.	$102\% \\ 81 \\ 81 \\ 60 \\ 50 \\ 40$	SWI	Cent. Rad.	200 132 75 60 60 40
	Point No.	41095-		Point No.	841095

	Correc-	T Rail	.001 .007 .007 .016 .023 .023		Outer Rail	31.68 32.73 33.76 33.76 34.81 35.85
- Internet	Length	Inner	5.099 10.168 20.207 25.179 30.120 35.028 35.028		Inner Rail	80.32 81.28 83.24 83.19 84.15
IN.	ngth	uter	5,163 5,163 5,855 5,855 5,843 5,843 5,810 5,810	S.	Outer Rail	25.46 26.49 28.55 28.56 28.56 28.66 39.66 30.64
21/2	Le	0	1110 112 112 112 112 112 112 112 112 112	A P.	Inner Rail	24.54 25.51 26.47 27.44 28.40 29.36 29.36
FT.			012200200122002001220020000000000000000	FROP	Duter Rail	19.28 20.31 23.33 24.43 24.43
GE, 5	Warein	THE IS A	.00007 .00067 .00269 .00745 .01675 .01675 .03273	CES	nner Rail	18.72 19.69 20.67 21.64 23.57 23.57 23.57
GA	ŝ	à	$\begin{array}{c} 0^{\circ} -42^{\circ}\\ 2^{\circ} -06^{\circ}\\ 4^{\circ} -12^{\circ}\\ 7^{\circ} -00^{\circ}\\ 114^{\circ} -42^{\circ}\\ 119^{\circ} -36^{\circ}\\ 119^{\circ} -36^{\circ}\end{array}$	TAN	uter ]	8.15 5.18 5.21 8.23 8.23 8.26 8.26
No. 4.	Rail	Y	5.099 10.166 15.198 20.173 25.086 29.906 84.595	D DIS	Inner O Rail J	12.85 13.84 15.84 15.79 15.77 17.74
SAL 1	Inner	x	0.081 0.155 0.432 0.920 0.920 1.676 2.754 4.201	E RO	Outer Rail	7.06 8.07 9.098 10.098 11.111 12.113
SPII	Analo	argur	0°-42' 1°-24' 2°-06' 2°-48' 8°-30' 4°-13' 4°-54'	IT	Inner Rail	6.94 7.98 8.92 9.91 10.89 11.87
	Cent.	Rad.	420 210 140 105 84 70 60 52%	128	Outer Rail	1.01 8.03 8.03 6.04 6.04
	Point	No.	-10804-1005-		Inner Rail	0.99 2.98 3.98 5.96 5.96

$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	vint Cent. Angle No. Rad. Angle							
No.         Rad.         Augue         X         Y         Outer         Inner         TRaii         This Ea           200         4°-00'         0.481         13.769         4°-00'         14.145         13.781         .006         0.G         0.1           4         1255½         3°-00'         1.098         20.173         7°-00'         20.855         20.216         .011         greater and           5         84         3°-30'         1.854         25.086         10°-30'         26.142         25.188         .016         G         0.11         greater and           6         70         4°-12'         2.932         29.906         14°-42'         31.464         30.128         .026         Spiral No.4	No. Rad. Angue	Innei	r Rail	ů	Length	Length	Correc-	
200         4°-00'         0.481         13.769         4°-00'         14.145         13.781         .006         0.G         0.1           4         125½         3°-00'         1.098         20.173         7°-00'         20.853         20.216         .011         greater and           5         84         3°-30'         1.854         25.086         10°-30'         26.142         25.188         .011         greater and           6         70         4°-12'         2.932         29.906         14°-42'         31.464         30.128         .026         Spiral No.4	200 4°-00	×	Х	2	Outer	Inner	T Rail	This Ease-
4         125½         3°-00'         1.098         20.173         7°-00'         20.852         20.216         .011         greater and           5         84         3°-30'         1.854         25.086         10°-30'         26.142         25.188         .016         G S equal           6         70         4°-12'         2.932         29.906         14°-42'         31.464         30.128         .023         Spiral No.4           7         60         4°-54'         4.379         34.565         19°-38'         36.819         35.037         .031		0.481	13.769	4°-00′	14.145	13.781	.006	ment gives an O G 0.178
5         84         3°-30'         1.854         25.086         10°-30'         26.142         25.188         .016         G S equal           6         70         4°-12'         2.932         29.906         14°-42'         31.464         30.128         .016         G S equal           7         60         4°-14'         4.379         34.565         19°-36'         36.819         35.037         .031	4 125½ 3°-00	1.098	20.173	,002	20.852	20.216	110.	greater and a
6         70         4°-12'         2.932         29.906         14°-42'         31.464         30.128         .023           7         60         4°-54'         4.379         34.565         19°-36'         36.819         35.037         031	5 84 3°-30	1.854	25.086	10°-30'	26.143	25.188	.016	G S equal to
7 60 4°-54′ 4 379 34 595 19°-36′ 36 819 35 037 031	6 70 4°-12	2.932	29.906	14°-42'	31.464	30.128	.023	.4. ONI TRIINO
	7 60 4°-54	4.379	34.595	19°-36'	36.819	35.037	.031	

	Correc-	tion for T Rail	002 005 006 008 008 018 028 028		Outer Rail	81.47 82.50 83.55 84.56 85.59 86.62	
	Lenoth	Inner	5.218 5.218 10.404 15.572 20.717 25.839 30.939 85.972 85.972		Inner Rail	80.58 81.50 83.47 83.44 83.44 83.44 85.38	
IN.	enoth	Duter	5.259 0.540 5.844 1.171 8.521 8.521 1.898 1.898 1.244	S.	Outer Rail	25.31 26.34 28.384 29.41 29.41 29.41 29.41 29.41	
. 21/2		en	8678 618 234 7716 053 224 324 324 324 324 3224 33 2224 33 192 3224 33 192 3224 33 324 32 324 32 324 32 32 32 32 32 32 32 32 32 32 32 32 32	M P.	Inner Rail	24.69 25.66 25.66 27.61 28.59 29.56 29.56	
5 FT		2 Ine	2222220 2222220 2222220 2222220 2222220 222222	FRO	Outer Rail	19.19 20.21 22.25 23.25 23.25 24.29	
AGE,		Vers	0000.0000000000000000000000000000000000	VCES	Inner Rail	18.81 19.79 20.77 21.775 21.775 22.773 23.71	
G	00	2	00-30 10-30 14-00-30 14-00-30	STAN	Outer Rail	13.10 14.11 15.13 16.14 17.16 18.18	
No. 5	r Rail	Y	5.218 15.667 15.667 20.699 25.790 25.790 80.828 85.744	ID DI	Inner Rail	12.90 13.89 15.86 15.86 17.82 17.82	
RAL	Inne	x	0.023 0.113 0.316 0.675 1.233 2.029 3.098	E RC	Outer Rail	7.04 8.05 9.06 110.06 111.07 12.09	
IdS	Amolo	aigny	80000000000000000000000000000000000000	E	Inner Rail	6.96 7.95 8.94 9.94 10.93 11.91	
	Cent.	Rad.	38022888		Outer Rail	1.00 2.01 5.02 6.03 6.03	
	Point	No.	H0:041005-		Inner Rail	1.00 2.99 3.98 5.97	

L.	Cent.		Inner	r Rail	ő	Length	Length	Correc-	
	Rad.	argur	x	X	2	Outer	Inner	T Rail	This Ease-
	200	4°-00'	0.481	13.769	4°-00'	14.145	13.781	.006	ment gives an O G equal to
	144	11°-00′	0.675	16.231	5°-00′	16.703	16.249	.008	and a G S
	120	2°-30'	1.233	21.322	7°-30'	22.053	21.371	.012	4.468 less than
	100	3°-00′	2.029	26.360	10°-30'	27.425	26.471	.016	יט יטעז וואווקט
	85	3°-30'	3.098	31.276	14°-00′	32.776	31.504	.022	and the

1
-
-
NO
1.
H/
CN.
<b>L</b>
2
LL.
-
10
6 28
-
TTT
and and
C D
$\mathbf{\nabla}$
-
<b>N</b>
-
17 In.
1 7
$\smile$
-
9
-
-
0
0
-
-
-
1 -
-
. 7
-
4
-
-1
CY.
-
0

Correc-tion for T Rail Outer Rail 31.31 32.33 33.35 33.35 33.37 35.39 36.41 Inner Rail 63263663 Length Inner 221 617 958 958 204 8288838 828820a Outer Rail 288223323 Length Outer 30.588.28 251 517 517 517 799 096 7734 054 s p. Inner Rail 728 222 23822885 00582 01745 03490 05814 05814 05814 05814 12187 16218 FROM Sine Outer Rail 20.14 20.14 22.17 23.18 24.20 Versine 00002 00015 00061 00169 00169 001891 00745 01324 DISTANCES Rail 8888888 33320.138 0°-20 2°-00 5°-00 7°-00 ŝ Outer Rail 13.07 15.08 15.08 17.11 18.12 221 615 931 931 931 931 931 Rail 12.93 14.92 16.91 17.88 Z Inner Rail 822001100 ROD Outer Rail  $\begin{array}{c} 0.015\\ 0.076\\ 0.211\\ 0.453\\ 0.827\\ 0.827\\ 2.091\\ 2.091 \end{array}$ 7.02 8.03 9.04 111.05 × TIE Inner Rail 6.98 7.97 8.96 9.96 10.95 Angle S 0°-20' 0°-40' 1°-20' 2°-00' 2°-20' Outer Rail Cent. Inner Rail 2.98 3.99 5.98 99 5.98 Point No. 10004000

58

THE

PENNSYLVANIA

STEEL

COMPANY

Length Length Correction for The Rail
14.145         13.781         .006         O G eq and a           18.640         18.186         .008         7.770 les
14.145 13.781 .006 0 G eq
ment gi
Outer Inner T Rail This
Length Length Correc-

	Correc-	T Rail	.000	.005	010	.028	1	)uter Rail	16.51 17.58 18.64 19.71 20.78	
	Length	Inner	2.595	10.237	15.215	20.078		Rail	4488888	
IN.	Length	Outer	2.641 5.806	7.995	16.201 18.061	21.766	S.	1   Inner	28283	
FT. 41/2	Cino	anic	.00873	.05234	.18000	. 30902	OM P	Outer Rai	11.26 12.30 13.35 14.40 15.45	
GE, 5	Trantan	ATTISTA	.00004 .00034	.00187	.01675	.04894	CES FR	nner Rail	10.74 11.70 13.65 14.55	
GA	°.	6	0°-30′ 1°-30′	2000 2000 2000	10°-30'	18°-00'	STANC	r Rail I		
Io. 2.	tail	Y	2.595	012.2	15.161	19.873	DIG	1 Oute	05-000 <u>0</u>	
RAL N	Inner R	x	0.011 0.056	0.156	0.991	2.177	E ROD	Inner Rai	6.88 6.88 9.88 88 7.85 88 7.85 88 7.85 88 7.85 88 7.81 88 7.81 88 7.81 88 7.81 88 7.81 88 7.81 88 7.81 88 88 88 88 88 88 88 88 88 88 88 88 8	
IIdS		argur	0°-30' 1°-00'	2°-00'	3°-00'	4°-00'	IT	uter Rail	1.01 2.08 3.08 5.07 5.07	
1	Cent.	Rad.	300 150	828	50	87% 83%	13	Rail O		
	Point	No.	100	œ 4 i	400	- 00		Inner	.1.8.8. 9.999	

2 IN.		This Ease- ment gives an	O G equal to	3.346 less than	Spiral No. 2.		
FT. 4.	Correc-	T Rail	.012	.016	.022	.028	
GE, 5	Lenoth	Inner	9.887	11.871	14.303	16.734	
GAG	Lenoth	Outer	10.621	12.857	15.617	18.422	
5 2-75.	ć	å	7°-50'	10°-30'	14°-00′	18°-00'	
ENT	Rail	X	9.856	11.815	14.191	16.526	
ASEM	Inner	x	.675	166.	1.507	2.177	
CH E		Angle	7°-50'	2°-40'	3°-30'	4°-00'	
LIMS	Cant	Rad.	75	451/3	42 1/2	37 1/2	
	Doint	No.		9	2	œ	

		SPIF	LAL 1	No. 2	%. G	AGE.	5 F	Γ. 4 <sup>1</sup> / <sub>7</sub>	N.		
	Cent.	Andla	Innei	Rail	ů	Trancis		H	ength	Length	Correc-
	Rad.	argury	х	Y	2	A GLSID	a	епе	Outer	Inner	T Rail
	444	00-20	200.	2.567	00-20	30000.	00.	582	2.599	2.567	0.000
-	148	10-00	0.108	229.7	20-00	19000	.03	190	7.843	7.655	0.008
_	111	10-20	0.221	10.172	30-20	.00162	120°	814	0.488	10.176	0.005
_	74	20-00	0.664	15.150	20-02	.00745	12	187	5.882	15.176	0.011
_	63%	20-20	1.015	17.602	90-20	.01324	.16	218	8.528	17.652	0.015
	202%	20-40	1.470	20.02	120-00	.02186	20	162	1.236	20.110	0.019
-	441%	30-20	2.734	24.705	18°-20'	.05076	18.	154	30.688	24.968	0.029
	40½	3°-40'	3.567	26.976	22°-00'	.07285	. 37	161 2	9.452	27.388	0.035
	糖	IT .	E RC	ID DI	STAN	ICES	FROJ	M P.	S.		
1	Outer Rail	Inner Rail	Outer Rail	Inner Rail	Outer Rail	Inner Rail	Outer Rail	Inner Rail	Outer Rail	Inner Rail	Outer Rail
	1.01	5.94	6.06	10.82	11.18	15.65 16.61	16.85 17.39	20.42 21.36	21.58 22.64	25.13 26.06	26.87
-	8.02 4.03	8.88	9.12	12.76	13.24	17.57	18.43	22.81	23.69	32.00	29.00
	5.04	9.85	10.15	14.69	15.31	19.47	20.53	24.19	25.81		

4½ IN.		This Easement	stres and a G equal to and a G S 8.640 less than Spiral No. 2½.	4½ IN.		This Easement	gives an O G 0.250 greater and a G S 8.286 great- er than Spiral No. 2%.
5 FT.	Correc-	T Rail	.010 .019 .024 .029 .085	5 FT.	Correc-	T Rail	.006 .011 .011 .019 .029 .029
AGE.	Length	Inner	11.304 16.470 18.895 21.327 28.747	AGE,	Length	Inner	13.775 15.979 15.979 20.945 20.945 23.846 23.846 23.846 23.846 23.861 20.681
00. G	Length	Outer	$\begin{array}{c} 11.914\\ 17.596\\ 20.308\\ 23.047\\ 25.811 \end{array}$	00. G	Length	Outer	14.151 16.449 19.125 21.821 24.529 27.529 27.529 281.881 281.745 32.745
S 21/2-1	ő	2	6°-80 12°-00 15°-00 18°-20 22°-00	6°-80 12°-00 18°-00 22°-00 22°-00 22°-20 S		20	$\begin{array}{c} 4^{\circ}-00'\\ 5^{\circ}-00'\\ 7^{\circ}-00'\\ 9^{\circ}-20'\\ 15^{\circ}-00'\\ 18^{\circ}-20'\\ 18^{\circ}-20'\\ 22^{\circ}-00'\\ 22^$
ENT	r Rail	Y	11.280 16.877 18.77 18.734 21.065 23.336	ENT	r Rail	X	13.763 15.962 15.962 20.888 20.888 23.800 25.600 27.991 30.262
ASEM	Innei	x	0.641 1.470 2.036 2.734 3.567	ASEM	Inne	X	0.480 0.654 0.914 1.720 2.986 2.984 3.817
CH I	Amelo	Augue	6°-30 5°-30 5°-30 3°-40 3°-40 3°-40 3°-40 3°-40 5°-40			Angle	4°-00' 1°-00' 2°-20' 2°-20' 3°-20' 3°-40' 3°-40' 3°-40'
LIMS	Cent.	Rad.	102% 56% 49 41% 40%	LIWS	Cent.	Rad.	2000 74 63% 55% 44% 40%
	Point	No.	8001		Point	No.	2002-2001

LIBRARE OF THE

		IdS	RAL	No. 3	. G4	AGE,	5 FT	. 4 <sup>1/2</sup>	IN.		
Point	Cent.	Andle	Innei	r Rail	00	1111		H	eneth	Leneth	Correc-
No.	Rad.	argury	х	Y	2	Versi	ne	не	Outer	Inner	tion for T Rail
63	300	10-0	0.046	5.189	1°-0	.0001	50.01	745	5.283	5.189 10.331	.002
69 4	100	3°-0' 4°-0'	0.624	15.407	6°-0′	.0151	9 .10	453	15.989	15.427 20.475	010
-100	884	20-06	2.409 3.989 5.828	25.286 29.996 34.141	215°-0 28°-0	.0840	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	882	26.884 82.401 87.616	25.476 30.431 34.990	.024 .033 .044
		IT	E RO	ID DI	STAN	VCES	FRO	M P.	s.		
Inner Rail	Outer Rail	Inner Rail	Outer Rail	Inner Rail	Outer Rail	Inner Rail	Outer Rail	Inner Rail	Outer Rail	Inner Rail	Outer Rail
2.97 3.96 3.97	1.01 3.08 3.08	6.98 9.87 9.87 9.87 9.87	7.08 8.10 9.11	12.79 13.76 14.74 15.71	13.21 14.24 15.26 16.29	18.60 20.53 21.48	19.40 20.43 21.47 22.52	24.85 25.30 26.25 27.20	26.70 28.70 28.70 28.70 28.80	80.04 80.98 81.91 82.84	81.96 83.02 84.09 85.16
5.95 26.95	6.06	11.82	12.18	12.64	17.83	23.39 23.39	24.61	29.09	30.91	33.77	86.23 87.29
- Anno											

	IMS	TCH	EASE	MENT	S 3-10	00. G1	AGE, 5	FT.	4½ IN.
Point	Cent.	Amoto	Innei	r Rail	ço	Length	Length	Correc-	This Ease-
No.	Rad.	Angle	x	х	2	Outer	Inner	T Rail	ment gives an
	1021/3	6°-30'	0.641	11.280	6°-30'	11.914	11.304	.010	O G equal to
4 10	60	5°-00'	2.409	20.895	15°-00'	22.497	21.089	.024	4.391 less than
91-	50 40	,0002	3.939 5.828	25.605 29.750	21°-00'	28.014 33.230	26.044 30.602	.033	Spiral No. 3.
	IWZ	TCH	EASEI	MENT	S 3-20	00. G1	AGE, 5	FT.	4½ IN.
Point	Cent.	Amelo	Inner	r Rail	ço	Length	Length	Correc-	This Ease-
No.	Rad.	argure	x	X	2	Outer	Inner	T Rail	ment gives an
	200	4°-00'	0.480	13.763	4°-00′	14.151	13.775	.006	0 G 0.250
00-	132	2°-00'	0.874	18.260	009	18.851	18.289	600.	Sicale and a
4 2	22	4000	1.577	23.257	10,-00,	24.275	23.337	910.	though the
<b>.</b> .	302	00-09	4 189	32, 849	21°-00'	35 263	33 293	033	greater than
-10	40	.002	6.078	36.994	28°-00'	40.478	37.852	.044	opital INU. 0.

	Correc-	T Rail	100. 100.		Outer Rail	81.70 32.74 83.79 84.84 85.88	
	Length	Inner	5.098 10.164 15.197 20.196 25.163 35.000 35.000		Inner Rail	30.30 31.26 33.21 33.21 33.21 33.16 33.16	
N.	eneth	uter	5.164 5.591 5.591 5.591 5.149 5.149 5.838 5.838	S.	Outer Rail	25.47 26.51 28.58 29.68 29.68 20.66	
41/2	Ĕ	o	245 245 245 245 245 245 245 245 245 245	M P.	Inner Rail	24.53 25.49 26.46 28.38 28.38 29.34 20.34	
5 FT.		alle	0.000000000000000000000000000000000000	FRO	Outer Rail	19.29 20.32 21.34 23.41 24.44	
GE.		V ersi	0000 0006 00741 00741 00741 00741 00579	ICES	Inner Rail	18.71 19.68 20.66 21.62 23.56 23.56 23.56	
. GA	°.	2	0°-42' 2°-05' 7°-00' 10°-80' 19°-86' 19°-86'	STAN	Outer Rail	18.15 14.17 15.19 15.21 17.22 18.26	
No. 4	Rail	Υ	6,098 10,163 15,187 20,187 25,071 25,071 29,885 34,567	ID DI	Inner Rail	12.85 18.83 14.81 15.79 16.76 17.74	
RAL	Inner	x	0.081 0.155 0.432 0.919 1.675 4.196 4.196	E RC	Outer Rail	7.06 8.07 9.08 10.10 11.11 12.13	
SPI	Amoria	argue	0°-42' 1°-24' 2°-06' 3°-48' 3°-48' 3°-48' 4°-12' 4°-54'	TI	Inner Rail	6.94 7.93 8.92 9.90 10.89 11.87	
- Ba	Cent.	Rad.	420 210 1140 105 84 84 70 60 52%	153	Outer Rail	1.01 2.02 2.03 5.03 6.04	
	Point	No.	H004005	-	Inner Rail	0.99 1.99 3.97 5.96 5.96	

THE	PENN	SYLV	ANIA	ST	EEL	co	MPANY	7 67
2 IN.		This Ease-	ment gives an O G 0.178	greater and a	G S equal to	opiral No. 4.		
FT. 4,	Correc-	T Rail	.006	.011	.016	.023	.031	
GE, 5	Length	Inner	13.775	20.206	25.172	30.106	35.009	
GAO	Length	Outer	14.151	20.862	26.158	31.486	36.847	
4-200.	CO	à	4°-00'	,002	10°-30'	14°-42'	19°-36′	
S TNE	Rail	X	13.763	20.162	25.071	29.885	34.567	
ASEMI	Inner	x	0.480	1.097	1.853	2.929	4.374	
CH E	America	argue	4°-00'	3°-00'	3°-30'	4°-12'	4°-54'	
TIWS	Cent.	Rad.	200	125 1/2	84	04	60	
	Point	No.		4	S	9	2	

	orrec-	r Rail	.001 .002 .005 .005 .018 .016 .012 .023		Outer Rail	31.48 32.51 33.54 33.54 33.56 33.60 36.60 36.60	
	ength C	Inner	5.213 15.402 115.667 20.709 25.828 80.924 83.951		Inner Rail	30.52 31.49 32.46 33.43 33.43 33.43 33.43 33.43 35.36	
IN.	ength I	Outer	5.259 5.259 15.849 21.179 21.179 26.552 31.908 37.265	S.	Outer Rail	25.32 26.35 27.37 28.40 29.43 29.43 20.43	
4 1/2	I		878 8678 8618 8716 8716 8724 8224 192	MP	Inner Rail	24.68 25.65 28.65 28.65 28.55 28.57 29.55 29.55 29.55 29.55 29.55 20.55	
FT S			4461660	FRO	Outer Rail	19.20 20.22 21.24 22.26 23.28 24.30	
GE,	Vancia	ITS TO A	0000-0008 00088 00088 00088 00088 00088 00088 00088 00088 00088 00088 00088 00088 00088 0000-00088 00080 00080 00080 00080 00080 00080 00080 000000	CES	Inner Rail	18.80 19.78 20.76 21.74 22.72 23.70 23.70	
. GA	ŝ	2	0°-30' 1°-30' 3°-00' 5°-00' 10°-30' 14°-00'	STAN	Outer Rail	18.10 14.12 15.13 16.15 17.16 18.18	
No. 5	Rail	Y	$\begin{array}{c} 5.213\\ 5.213\\ 15.562\\ 20.692\\ 25.779\\ 20.812\\ 30.812\\ 35.724\\ 35.724\\ \end{array}$	D DI	Inner Rail	12.90 14.87 15.85 16.84 17.82	
RAL	Inner	x	.023 .113 .816 .875 1.232 2.028 3.095	E RO	Outer Rail	7.04 8.05 9.06 11.08 11.08	
IdS	Andle	Augue	00-30 20-30 20-30 20-30 20-30 8-30 8-30 8-30	IT	Inner Rail	6.96 7.95 8.94 9.98 10.92 11.91	
	Cent.	Rad.	88000000000000000000000000000000000000		Outer Rail	1.00 8.01 5.02 6.03 6.03	
	Point	No.	100341097-		Inner Rail	$\begin{array}{c} 1.00\\ 2.99\\ 3.98\\ 5.97\\ 5.97\end{array}$	
½ IN.		This Ease- ment vives an	O G equal to	and a G S 4 468 less	than Spiral	No. 5.	
--------	-----------------	-----------------------------	--------------	-------------------------	-------------	---------	---------
FT. 4	Correc-	T Rail	.006	.008	.012	.016	.022
GE, 5	Length	Inner	18.775	16.241	21.360	26.455	31.483
GA	Length Outer		14.151	16.711	22.064	27.441	32.797
5-200.	ů	2	4°-00′	5°-00′	7°-30'	10°-30′	14°-00′
ENT	Rail	Y	13.763	16.224	21.311	26.344	31.256
ASEMI	Inner	x	0.480	0.675	1.232	2.028	3.095
CH E	Angle -		4°-00′	1°-00′	2°-30'	3°-00'	3°-30'
LIWS	Cent.	Rad.	200	144	120	100	85-
	Point	No.		4	10	9	2

	Correc-	T Rail	.001 .008 .008 .008 .011 .015		Outer Rail	81.32 32.34 33.36 34.38 85.40 86.42
	ength	Inner	5.220 10.425 15.614 20.788 25.945 31.088 36.191		Inner Rail	30.68 31.66 32.64 33.62 33.62 33.62 35.58
IN.	angth 1	uter	5.252 0.519 5.802 5.802 1.100 3.415 1.744 7.067	S.	Outer Rail	25.22 26.23 27.25 29.29 80.30
. 4 1/2	Le	0	582 582 582 582 582 582 582 514 514 514 514 518 518 518 518 518 518 518 518 518 518	M P.	Inner Rail	24.778 25.777 26.775 28.773 29.70 29.70
5 FT	U.		005000000000000000000000000000000000000	FROI	Outer Rail	19.13 20.14 21.16 22.17 23.19 24.20
. GAGE,	Vers		0000 0006 00088 00088 00088 00088 00088 00088 00088 00088 00088 00088 00088 00088 00088 00088 00088 00000 00000 00000 00000 00000 00000 0000	ICES	Inner Rail	18.87 20.84 20.85 21.83 28.81 28.81 28.81 28.81 28.81 28.80
	ŝ	2	$\begin{array}{c} 0^{\circ} -20^{\circ}\\ 2^{\circ} -20^{\circ}\\ 5^{\circ} -20^{\circ}\\ 7^{\circ} -20^{\circ}\\ 9^{\circ} -20^{\circ}\end{array}$	STAN	Outer Rail	13.07 14.08 15.09 16.10 17.11 18.12
No. 6	Rail	Χ	$\begin{array}{c} 5.220\\ 5.220\\ 15.425\\ 15.612\\ 25.9780\\ 25.9780\\ 25.087\\ 81.087\\ 86.089\end{array}$	D DI	Inner Rail	12.98 14.91 14.91 16.89 16.89 17.88
RAL	Inner	х	0.015 0.076 0.211 0.452 0.827 1.865 2.089	E RO	Outer Rail	7.08 8.03 9.04 110.04 12.06
SPI	Anorla	angue	0°-20 0°-20 1°-20 2°-20 2°-20	IT	Inner Rail	6.97 7.97 8.96 9.96 10.95 11.94
	Cent.	Rad.	900 450 300 150 113% 113%		Outer Rail	1.00 8.01 6.02 6.00 6.00
	Point	No.	H00041005-		Inner Rail	1.00 2.99 5.99 5.99 5.98

int	Cent.		Inner	r Rail	°.	Length	Length	Correc-	
	Rad.	argur	x	X	2	Outer	Inner	T Rail	This Ease
	200	4°-00'	0.480	13.763	4°-00'	14.151	13.775	900.	O G equal to
	255	1°-00′	0.827	18.154	5°-00'	18.648	18.178	.008	7 770 less that
	150	2°-00'	1.365	23.267	,001	23.977	23.321	.011	Spiral No. 6.
	128	2°-20'	2.089	28.319	9°-20'	29.300	28.424	.015	



73

# Middle Ordinates for 10-Foot Chords.

# MIDDLE ORDINATES, 10 FT. CHORDS

м. о.	Radius	м. о.	Radius	м. о.	Radius
$0"$ $\frac{1}{32}"$ $\frac{1}{16}"$ $\frac{3}{32}"$ $\frac{1}{18}"$	infinity 4807'- 8" 2399'- 3" 1600'- 6" 1200'- 9"	$\begin{array}{c} 1'' \\ 1\frac{1}{82''} \\ 1\frac{1}{16''} \\ 1\frac{3}{82''} \\ 1\frac{1}{8''} \\ 1\frac{1}{8''} \end{array}$	$\begin{array}{c} 150' - & 0 & \frac{1}{2}'' \\ 145' - & 6'' \\ 141' - & 2\frac{11''}{16} \\ 137' - & 2\frac{3}{8}'' \\ 133' - & 4\frac{3}{4}'' \end{array}$	$\begin{array}{c} 2'' \\ 2\frac{1}{32''} \\ 2\frac{1}{16''} \\ 2\frac{3}{32''} \\ 2\frac{3}{32''} \\ 2\frac{1}{18''} \\ 2\frac{1}{8''} \end{array}$	$\begin{array}{c} 75'-1"\\ 73'-11_{\overline{16}}"\\ 72'-934"\\ 71'-834"\\ 70'-8\frac{1}{8}"\end{array}$
5 3 3 5 7 2 8 1 4 9 2 1 4 9 2 2	$\begin{array}{c} 960'-1''\\ 800'-3\frac{3}{16}''\\ 682'-3\frac{3}{16}''\\ 600'-0\frac{1}{18}''\\ 533'-4\frac{1}{18}''\\ \end{array}$	$1\frac{5}{32}" \\ 1\frac{8}{16}" \\ 1\frac{7}{32}" \\ 1\frac{7}{32}" \\ 1\frac{7}{32}" \\ 1\frac{7}{32}" \\ 1\frac{7}{32}" \\ 1\frac{9}{32}" \\ 1$	$\begin{array}{c} 129' - 9\frac{5}{16}"\\ 126' - 4\frac{3}{8}"\\ 123' - 2\frac{3}{8}"\\ 120' - 0\frac{5}{8}"\\ 117' - 1\frac{1}{2}"\end{array}$	$\begin{array}{c} 2\frac{5}{32}^{"}\\ 2\frac{5}{16}^{"}\\ 2\frac{5}{32}^{"}\\ 2\frac{5}{32}^{"}\\ 2\frac{14}{32}^{"}\\ 2\frac{9}{32}^{"}\end{array}$	$\begin{array}{c} 69' - ~ 7 7\!\!\!\!/8''\\ 68' - ~ 7\!\!\!\!\frac{15}{16}''\\ 67' - ~ 8\!\!\!/8''\\ 66' - ~ 9 1\!\!\!/8''\\ 65' - 10\!\!\!\!\frac{3}{16}''\\ \end{array}$
5 101 132 3 8 102 102 10 10 10 10 10 10 10 10	$\begin{array}{c} 480'- \ 0 \frac{3}{16}'' \\ 436'- \ 4 \frac{9}{16}'' \\ 400'- \ 0 \frac{3}{16}'' \\ 369'- \ 3'' \\ 342'-10 \frac{5}{16}'' \end{array}$	$1\frac{5}{16}^{"}$ $1\frac{11}{32}^{"}$ $1\frac{3}{8}^{"}$ $1\frac{18}{32}^{"}$ $1\frac{7}{16}^{"}$	$\begin{array}{c} 114' - \ 4\frac{1}{8}''\\ 111' - \ 8\frac{3}{16}''\\ 109' - \ 1\frac{3}{4}''\\ 106' - \ 8\frac{11}{16}''\\ 104' - \ 4\frac{16}{16}''\\ \end{array}$	$\begin{array}{c} 2 \\ 5 \\ 1 \\ 1 \\ 1 \\ 2 \\ 3 \\ 3 \\ 2 \\ 3 \\ 2 \\ 3 \\ 2 \\ 3 \\ 7 \\ 1 \\ 6 \\ \end{array}$	$\begin{array}{c} 64'-11\frac{9}{16}''\\ 64'-1\frac{3}{16}''\\ 63'-3\frac{1}{16}''\\ 62'-5\frac{1}{4}''\\ 61'-7\frac{11}{16}''\end{array}$
1527 n 1272 n 1272 n 1272 n 1092	$\begin{array}{c} 320' - \ 0 \ \frac{1}{2}'' \\ 300' - \ 0 \ \frac{1}{4}'' \\ 282' - \ 4 \ \frac{9}{16}'' \\ 266' - \ 8 \ \frac{1}{16}'' \\ 253' - \ 0 \ \frac{15}{16}'' \end{array}$	$\begin{array}{c} 1\frac{15}{82}^{n} \\ 1\frac{12}{12} \\ 1\frac{17}{82}^{n} \\ 1\frac{9}{16}^{n} \\ 1\frac{19}{82}^{n} \end{array}$	$\begin{array}{c} 102' - 2\frac{1}{4}''\\ 100' - 0\frac{3}{4}''\\ 98' - 0\frac{1}{4}''\\ 96' - 0\frac{3}{4}''\\ 94' - 2\frac{3}{16}''\end{array}$	21552/" 21/2" 21/2" 21/2" 21/2" 21/5 2 11/5 2 11/5 2	$\begin{array}{c} 60'-10 \frac{5}{16}"\\ 60'-1\frac{1}{4}"\\ 59'-4\frac{3}{8}"\\ 58'-7\frac{3}{4}"\\ 57'-11\frac{1}{4}"\end{array}$
10 1021100001/4 10/20 202111120001/4 10/20	$\begin{array}{c} 240'-0.7.''\\ 228'-7.1''\\ 218'-1.15''\\ 209'-1.15''\\ 200'-2.9''\\ 192'-0.38''\\ \end{array}$	$\begin{array}{c} 158'' \\ 1\frac{21}{322''} \\ 1\frac{11}{16} \\ 1\frac{38}{322''} \\ 134'' \\ 1\frac{25}{322'} \end{array}$	$\begin{array}{c}92'-4\frac{1'2''}{90'-7\frac{1''}{16}}\\88'-11\frac{1'2''}{87'-4\frac{1'8''}{85'-9\frac{7}{16}}}\\85'-9\frac{7}{16}\\84'-3\frac{7}{16}\end{array}$	$\begin{array}{c} 258 \\ 258 \\ 21316 \\ 211232 \\ 211232 \\ 2323 \\ 2323 \\ 2323 \\ 232 \\ $	$\begin{array}{c} 57'-3''\\ 56'-7''\\ 55'-11\frac{1}{5}''\\ 55'-3\frac{7}{16}''\\ 54'-7\frac{16}{16}''\\ 54'-0\frac{9}{16}''\end{array}$
111200 7/20011100 111200 7/20011100 20011100	$\begin{array}{c} 184'-7\frac{3}{4}''\\ 177'-9\frac{11}{16}''\\ 171'-5\frac{1}{2}''\\ 165'-65''\\ 160'-0\frac{5}{4}''\\ 154'-10\frac{1}{2}''\\ \end{array}$	$\begin{array}{c}1 \frac{1}{1} \frac{3}{10} \frac{6}{10} \frac{1}{100} $	$\begin{array}{c} 82'-10''\\ 81'-5{}^{\prime}\!$	22 22 22 22 22 22 22 22 22 22 22 22 22	$\begin{array}{c} 53'-5\frac{7}{16}''\\ 52'-10\frac{3}{8}''\\ 52'-3\frac{1}{2}''\\ 51'-8\frac{15}{16}''\\ 51'-2\frac{1}{4}''\\ 50'-7\frac{18}{16}''\\ 50'-7\frac{18}{16}''\end{array}$

MIDDLE ORDINATES, 10 FT. CHORDS

м. о.	Radius	м. о.	Radius	м. о.	Radius
$3''_{82}''_{32}''_{32}''_{32}''_{32}''_{32}''_{32}''_{8}''_{8}$	$\begin{array}{c} 50'-1\frac{1}{2}''\\ 49'-7\frac{5}{16}''\\ 49'-1\frac{1}{4}''\\ 48'-7\frac{3}{8}''\\ 48'-1\frac{9}{16}''\end{array}$	$\begin{array}{c} 4'' \\ 4 \frac{1}{832}'' \\ 4 \frac{1}{16}'' \\ 4 \frac{3}{32}'' \\ 4 \frac{1}{8}'' \\ 4 \frac{1}{8}'' \end{array}$	$\begin{array}{c} 37'-8''\\ 37'-4\frac{1}{2}''\\ 37'-1\frac{1}{8}''\\ 36'-9\frac{3}{4}''\\ 36'-6\frac{7}{16}''\end{array}$	$5'' \\ 5\frac{1}{32}'' \\ 5\frac{1}{16}'' \\ 5\frac{8}{32}'' \\ 5\frac{8}{32}'' \\ 5\frac{1}{8}'' \\ 5\frac{1}{$	$\begin{array}{c} 30'-2\frac{1}{2}''\\ 30'-0\frac{1}{4}''\\ 29'-10\frac{1}{16}''\\ 29'-7\frac{1}{16}''\\ 29'-5\frac{1}{16}''\\ 29'-5\frac{1}{16}''\end{array}$
$3\frac{5}{32}, \frac{5}{32}, 5$	$\begin{array}{r} 47'-7\%''\\ 47'-2\frac{5}{16}''\\ 46'-8\frac{13}{16}''\\ 46'-3\frac{1}{2}''\\ 45'-10\frac{3}{16}''\end{array}$	$\begin{array}{c} 4\frac{5}{32}"\\ 4\frac{3}{16}"\\ 4\frac{7}{32}"\\ 4\frac{7}{32}"\\ 4\frac{1}{4}"\\ 4\frac{9}{32}"\end{array}$	$\begin{array}{c} 36'-3\frac{3}{16}''\\ 35'-11\frac{15''}{16}''\\ 35'-8\frac{3}{4}''\\ 35'-5\frac{11}{16}''\\ 35'-2\frac{9}{16}''\end{array}$	$\begin{array}{c} 5\frac{5}{3}\frac{5}{3}\frac{7}{3}\frac$	$\begin{array}{c} 29' - \ 3\frac{11}{18}''\\ 29' - \ 1\frac{7}{16}''\\ 28' - 11\frac{1}{2}''\\ 28' - 9\frac{1}{2}''\\ 28' - 9\frac{1}{2}''\\ 28' - 7\frac{1}{2}''\end{array}$
3 3 3 3 3 3 3 3 3 3 3 3 3 3	$\begin{array}{c} 45'-5\frac{1}{16}''\\ 45'-0''\\ 44'-7''\\ 44'-2\frac{1}{8}''\\ 43'-9\frac{3}{8}''\end{array}$	$\begin{array}{c} 4 \frac{5}{16} n \\ 4 \frac{11}{32} n \\ 4 \frac{3}{8} n \\ 4 \frac{13}{92} n \\ 4 \frac{13}{16} n \\ 4 \frac{13}{16} n \\ 4 \frac{13}{16} n \\ 1 \frac{1}{16} \end{array}$	$\begin{array}{c} 34'-11\frac{9}{16}"\\ 34'-8\frac{9}{16}"\\ 34'-5\%"\\ 34'-2\frac{11}{16}"\\ 34'-2\frac{11}{16}"\\ 33'-11\%"\end{array}$	$\begin{array}{c} 5 \\ 5 \\ 16 \\ 5 \\ 33 \\ 8 \\ 5 \\ 5 \\ 5 \\ 7 \\ 6 \\ 5 \\ 7 \\ 6 \\ \end{array}$	$\begin{array}{c} 28'-5\frac{1}{2}''\\ 28'-3\frac{1}{2}''\\ 28'-1\frac{9}{16}''\\ 27'-11\frac{58}{3}''\\ 27'-9\frac{3}{4}''\end{array}$
$\begin{array}{c} 3\frac{15}{3}\frac{5}{2}\frac{9}{2}\frac{1}{2}\frac{1}{2}\frac{1}{3}\frac{9}{2}\frac{9}{2}\frac{1}{2}\frac{1}{3}\frac{9}{2}\frac{9}{2}\frac{1}{2}\frac{1}{3}\frac{9}{2}\frac{9}{2}\frac{1}{2}\frac{1}{3}\frac{9}{2}\frac{9}{2}\frac{1}{2}\frac{1}{3}\frac{9}{2}\frac{9}{2}\frac{1}{2}\frac{1}{3}\frac{9}{2}\frac{1}{2}\frac{1}{3}\frac{9}{2}\frac{1}{2}\frac{1}{3}\frac{9}{2}\frac{1}{2}\frac{1}{3}\frac{9}{2}\frac{1}{2}\frac{1}{3}\frac{1}{3}\frac{9}{2}\frac{1}{2}\frac{1}{3}\frac{1}{3}\frac{1}{2}\frac{1}{3}\frac{1}{3}\frac{1}{2}\frac{1}{3}$	$\begin{array}{c} 43' - \ 4\frac{11}{16}'' \\ 43' - \ 0\frac{1}{16}'' \\ 42' - \ 7\frac{1}{2}'' \\ 42' - \ 3\frac{1}{16}'' \\ 41' - 10\frac{1}{16}'' \end{array}$	$\begin{array}{c} 415'' \\ 412'' \\ 412'' \\ 412'' \\ 4132'' \\ 49'' \\ 419'' \\ 419'' \\ 419'' \\ 432'' \\ \end{array}$	$\begin{array}{c} 33' - \ 9\frac{1}{16}''\\ 33' - \ 6\frac{1}{4}''\\ 33' - \ 3\frac{1}{2}''\\ 33' - \ 0\frac{1}{16}''\\ 32' - 10\frac{1}{18}''\\ 32' - 10\frac{1}{8}''\end{array}$	$\begin{array}{c} 5\frac{15}{32}, \\ 5\frac{15}{32}, \\ 5\frac{17}{2}, \\ 5\frac{17}{2}, \\ 5\frac{17}{32}, \\ 5\frac{17}{32}, \\ 5\frac{19}{32}, \\ 5\frac{19}{32},$	$\begin{array}{c} 27' - \ 7 \ 7 \ 8'' \\ 27' - \ 6'' \\ 27' - \ 4 \ \frac{3}{1 \ 6}'' \\ 27' - \ 2 \ 3 \ 8'' \\ 27' - \ 2 \ 3 \ 8'' \\ 27' - \ 0 \ \frac{9}{1 \ 6}'' \end{array}$
5) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2	$\begin{array}{r} 41'- \ 6\frac{3}{8}''\\ 41'- \ 2\frac{1}{8}''\\ 40'-10''\\ 40'- \ 5\frac{7}{8}''\\ 40'- \ 1\frac{7}{8}''\\ 39'- \ 9\frac{1}{16}''\\ \end{array}$	$\begin{array}{c} 458'' \\ 4312'' \\ 4322'' \\ 411632''' \\ 4232'''' \\ 434''' \\ 434''' \\ 433'''''' \\ 433''''''''''$	$\begin{array}{c} 32' - 7 \frac{1}{2}'' \\ 32' - 478'' \\ 32' - 238'' \\ 31' - 11 \frac{18}{16}'' \\ 31' - 9 \frac{16}{16}'' \\ 31' - 678'' \end{array}$	5 5 5 1 2 2 1 1 2 2 2 1 2 2 2 1 2 2 2 1 2 2 2 1 2 2 2 2 1 2	$\begin{array}{c} 26'-10\frac{1}{16}"\\ 26'-9\frac{1}{16}"\\ 26'-7\frac{5}{16}"\\ 26'-5\frac{9}{16}"\\ 26'-3\frac{1}{16}"\\ 26'-3\frac{1}{16}"\\ 26'-2\frac{1}{4}"\end{array}$
2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	$\begin{array}{c} 39' - \ 6 \frac{1}{16}'' \\ 39' - \ 2 \frac{3}{16}'' \\ 38' - 10 \frac{7}{16}'' \\ 38' - \ 6 \frac{3}{4}'' \\ 38' - \ 3 \frac{1}{8}'' \\ 38' - \ 3 \frac{1}{8}'' \\ 37' - 11 \frac{1}{2}'' \end{array}$	4158 " 42252" 47% " 42252" 47% " 42552" 41161" 4552	$\begin{array}{c} 31'-43''_{8}\\ 31'-2\frac{1}{16}''_{8}\\ 30'-115''_{8}\\ 30'-9\frac{5}{16}''_{8}\\ 30'-7''_{8}\\ 30'-43''_{8}\end{array}$	CI CI CI CI CI CI CI CI estantinolità / contentin estantes estantes estantes estantes estantes estantes	$\begin{array}{c} 26'-0 \frac{9}{16}"\\ 25'-10\frac{15}{16}"\\ 25'-9\frac{6}{16}"\\ 25'-7\frac{11}{16}"\\ 25'-6\frac{1}{2}"\\ 25'-4\frac{9}{16}"\end{array}$

# Wheel Contours



GREAT variety of wheel conle tours are used on street railways, and often the extremes are used on the same track system to the great detriment of both special work and wheels.

Since there are now no standard wheel contours except the M. C. B. (steam railroad), it seems proper to offer some designs which will meet most of the difficulties found in our practice.

The contour of wheel fixes the character of the special work as to whether the frog work is to be "flange bearing." This term means that at the "waist of frog," i. e., just in advance of the point of frog, the floor of the throat is raised to carry the wheel through the waist and past the point upon its flange. The latter cannot be of a shape or character of metal well adapted to this service, and more or less chipped flanges are thereby caused. It is, however, inevitable that this support be provided,

77

unless the tread is wide enough to carry the wheel past this critical point.

Contour "A" is the M. C. B. standard wheel, and is adapted to open track and streets where rails with deep and wide flangeways are provided, and the paving is such that the tread will not be seriously chipped by contact with the same.

Contour "B" is a compromise wheel, for use where a portion of the track system is used by wheels having Contour "A" and the remainder has not the deep flangeway, but the width of flangeway is provided. If the paving conditions of this portion are such that the width of tread must be reduced from that shown, all frog work on the entire portion of system used by Contour "B" must be made "flange bearing."

Contour "C" is adapted to track systems where wide and deep flangeways cannot be provided but the paving conditions are such that the width of the tread shown can be used.

Contour "D" is adapted to track systems where a narrower tread is required by the paving conditions, the shape and size of flange being the same as "C." As wide a tread as possible should be used, as the life of special work will thereby be materially prolonged besides increasing the factor of safety on any open track in the system. "Flange-bearing" frogs will be required for this contour.

Contours "A" and "C" will give the best results where conditions permit their use and do not require "flange-bearing" frogs.

Contour "B" will not give entire satisfaction, since the flange is not of the best shape, and should only be used when compelled by the conditions stated.

Contours "C" and "D" can be used on the same track system if "flange-bearing" frogs are provided for that portion on which Contour "D" is used.

Contours "C" and "D" cannot be satisfactorily used on track systems designed for Contours "A" or "B," or vice versa.







# Angles

Bulb

Reinforcing Switch

Equal Legs

Unequal Legs

#### Braces

Acme

Switch

Guard

Interlocking Tie Plate

# Bridges

## Buildings

# Chairs

Rail chairs for steam railroads in paved streets

# Channels

# Circles

Turntables Coal storage tracks

# Clamps

Guard rail

# Crossings

Bolted

Bolted Plate Keyed

"Manard" Steel Movable Point Riveted

Street Railway

"Manard" Renewable Centre Double Slip Single Slip

Three Rail







#### Crossovers

Single Crossovers Double Crossovers Portable Crossovers

# Forgings

Frogs, Rigid

Bolted

Bolted Plate Keved

"Manard" Steel

"Manard" Renewable Centre

Riveted

# Frogs, Spring

Bolted

Bolted Plate Double

Hinged

Keyed

"Manard" Steel Riveted Plate Twin

Vaughan Hinged Vaughan Sliding

#### Joints

Angle

Channel Compromise Deep Girder Rail Plain

#### Knees

#### Mates '

Built

"Manard" Bolted "Manard" Key Fast

#### Plates

, Frog Slide

Switch

Tie

Rails, Guard









RAPID RENEWABLE MANARD CENTRE FROG

# Rails

A. S. C. E. Sections Cast Weld Compromise Check

Flat

Girder

Slot Rails and Conductor Bars Tee

High Tee

Tram

Rails, Renewable Guard

Girder Guard

Rods, Switch Connecting

Splice Bars

Spikes

Spiral Curves

Steam Railroad Track Equipment

Street Railway Special Work

Street Railway Track Fastenings

# Steel

Bessemer Billets

Blooms

Castings

Forgings

Flats

Basic Open Hearth "Manard" Merchant

Round

Shapes

Slabs

Special

Square Tool

Structural Steel







## GROUND LEVER, MODEL 16



LOW NEW CENTURY ADJUSTABLE SWITCH STAND MODEL 51 A



# Switches

Adjustable Angle

Challenge

Lorenz

- "Manard" Big Pin Grooved Tongue
  - "Manard" Big Pin Tongue

"Manard" Steel Plain

Reinforced

Socket

Stub

# Three Way

#### Switch Stands

Automatic Banner Steelton Detective Ground Levers Upright Levers Long Safety Main Line Adjustable

Main Line Adjustable Positive Automatic

Mine

Mine Kickover New Century New Century Adjustable New Era

Pet

Semaphore with disappearing blade Spring Ground Throw Yard Stands

Tie Plates Tie Rods Track Bolts Track Fastenings Track Girders Track Material of All Kinds Trough Floors Trough Sections Viaducts "Z" Bars





Chasmar-Winchell Press New York and Pittsburgh


















TO 2	02 Main Library
100 M 20	UNIVERSITY OF CALIFORNIA BER BERKELEY, CA 9 47 20
yde s	
WI SHOOK TW	AT BE DECALLED AFTER 7 DAYS
Research and	Rache gost mey be mude A day . of at to the fund
. Books may be	Romen ad by calling 042-3405
	SUEAS STAMPED BELOW
IN 1838	
HAR 7 S	3
H. C. 629	N N N



